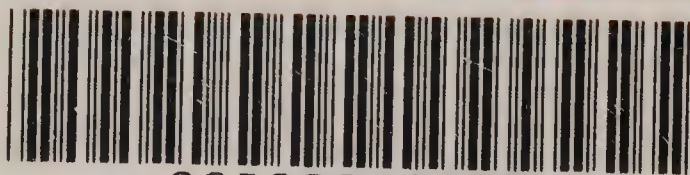




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THE  
CHEMICAL GAZETTE,

OR,  
JOURNAL OF PRACTICAL CHEMISTRY,

IN ALL ITS APPLICATIONS TO  
PHARMACY, ARTS AND MANUFACTURES.

CONDUCTED BY  
WILLIAM FRANCIS AND HENRY CROFT,

LATE STUDENTS IN THE UNIVERSITIES OF BERLIN AND GIESSEN.

VOLUME I. 1842-1843.

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## P R E F A C E.

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AT the completion of this our first volume we may be allowed the indulgence usually granted to editors of addressing a few lines to those who have kindly given us their support in our somewhat arduous undertaking. The great success which has hitherto attended our endeavours, and the favourable notice taken of our Journal, both in our own country and in America, have afforded proofs of the truth of the assertion which we ventured to make in the Introduction, that some such vehicle was wanted for communicating at a moderate expense the progress of chemical science, both theoretical and applied.

In the early part of the year 1841, in conjunction with my friend Mr. Croft, I commenced a series of reports of the progress of chemical science on the Continent, which were forwarded nearly every month from Berlin, and subsequently from Giessen, for insertion in the *Philosophical Magazine*; but the space allotted to us in that valuable Journal, whose pages are occupied with memoirs of the highest scientific character, allowed us only to notice the most important discoveries bearing upon theory; and we were compelled to leave wholly untouched the immense mass of information pertaining to applied chemistry, with which the German Journals in particular abounded. Feeling how important it was that the practical chemists of England should be made early acquainted with the improvements and new processes suggested or adopted on the Continent, we resolved, on our return to our native country, to see how far an attempt to lay these before the public in an English dress would meet with support. The experiment was made, and it has succeeded far beyond our expectations.



Although unfortunately soon deprived of the valuable and efficient assistance of my friend and fellow-student Mr. Croft, who, before the fourth number made its appearance, was called to the Professorship of Chemistry at King's College, Toronto, I do not fear to submit to the judgement of the public the volume now completed. Every *Foreign* Journal has been ransacked to furnish information for the readers of the Gazette; and many are the valuable articles that have appeared exclusively in its pages.

In conclusion, I beg to return my sincere thanks to the Subscribers, many of whom have contributed largely to the success of this undertaking by their advice, and by making it known among their friends. They may be assured it will always be my endeavour, however laborious the task, to increase the value of the Journal, and to render it a complete report of the progress of chemical science in all its branches.

There will be as heretofore a *Stamped* Edition, the usefulness of which has been satisfactorily proved from its affording the means of furnishing early intelligence to many correspondents in remote parts of the British Empire, to whom, were it issued in a different form, its transmission would be tardy and uncertain.

A copious Index has been given, which it is hoped will add much to the usefulness of the volume.

WILLIAM FRANCIS.



# THE CHEMICAL GAZETTE.

No. I.—Nov. 1, 1842.

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## INTRODUCTION.

AT the present day, when, from the rapid strides which Chemistry is making, it is extending its branches through the other sciences, and making its influence and utility felt, not merely by those who are practically employed in it, but also by those who are engaged in numerous occupations connected with many of the various and most important arts of life, it has seemed desirable that there should exist in this country some vehicle for bringing before the public the earliest accounts of all new discoveries, and their applications, whether to Medicine and Pharmacy, Arts and Manufactures, or to Agriculture. A work of this kind appears to be still a desideratum among us: not so on the Continent. In Germany we find the *Journal für praktische Chemie* and the *Pharmaceutische Central-Blatt*, supplying those engaged in chemical pursuits with abundance of new, and, to them, most valuable facts; and the French Pharmacien finds in the *Journal de Pharmacie* a vehicle for imparting and receiving knowledge of the same kind. To this circumstance, perhaps, we may ascribe, in some degree, the present advanced state of Pharmaceutical Chemistry, and indeed of Chemistry in general, compared with that which exists in England; for who are more able to contribute to the advancement of a science than those practically engaged in it? In those countries we find many of the most celebrated and able chemists belonging to the Pharmaceutical profession. In our own country we have recently seen the establishment of the Chemical Society and of the Pharmaceutical Society, indicating that Chemistry is here also engaging increased attention, and proving the desire of those who are professionally connected with the science both to witness and to promote its advancement.

To point out to the Pharmaceutist all new methods of forming his preparations, to make known to the Manufacturer the new processes described on the Continent, and to acquaint him with the



which seems to prove that Prout's idea of all atomic weights being multiples of that of hydrogen is correct. They have as yet examined only the following bodies:—

Oxygen .....	=	100	1
Hydrogen .....	=	12.5	8
Carbon .....	=	75	6
Nitrogen.....	=	175	14
Calcium .....	=	250	20
Chlorine.....	=	450	36
Silver .....	=	1375	110
Mercury.....	=	1250	100
Lead .....	=	1300	104

Some experiments were made by M. Robert in Dumas' laboratory on the atomic weight of calcium; he found the same as Marchand and Erdmann.

We have given the old atomic weight of cerium, and have omitted that of lanthanum, which has recently been determined by Marchand, as Mosander, the discoverer of lanthanum, has found that these metals are always mixed with a third new element (didymium), from which at present it is impossible to separate them.

With respect to glucinum, the old atomic weight, which we have nevertheless inserted in our table, has been shown to be totally erroneous by the recent valuable researches made by Awdejew in the laboratory of Prof. Rose, and of which an account will be found inserted in one of the following pages.

## SCIENTIFIC AND MEDICINAL CHEMISTRY.

### *On the Tests for Arsenic.*

THE importance of this subject in medical jurisprudence, and the attention which has recently been drawn to it by the late trial of Madame Laffarge, has called forth a number of valuable papers tending to render its detection more certain and precise; these researches being scattered through the pages of the numerous foreign journals, we have endeavoured to embody them in our present article.

One of the great difficulties in testing for arsenic by Marsh's apparatus, is the quantity of froth which is formed if the solution contain organic matters; it is absolutely necessary first of all to destroy these, and the best method of doing so has been proposed by Danger and Flandin. The organic substance is heated with one-sixth of its weight of concentrated sulphuric acid. The substance is dissolved and then carbonized without foaming, the mass being continually stirred until the charcoal is dry. A small quantity of nitric acid or aqua regia is now added, to increase the solubility of the arsenic, by converting it into arsenic acid; the whole is then extracted with water, and the solution tested in Marsh's apparatus. It



is better not to employ the carbonizing process if the chemist can examine the substances which have been thrown up from the stomach by the poisoned person, or that part of them which remains behind in the alimentary canal: this process is only to be used when the first attempts have been without success. It must not be considered that if, by means of Marsh's apparatus, we obtain a metallic spot, that therefore arsenic is present; the apparatus is really only a means of collecting and condensing the arsenic, but not of *directly* proving its presence, for very similar spots are produced from various causes; as, for instance, glasses containing lead\*, porcelain with a lead glaze, or even spots of oxysulphuret of zinc carried over by the stream of gas, if the zinc contains a little sulphur. Orfila found that by the action of a strong flame on organic fluids, peculiar spots were deposited on cold bodies, which he called fat-spots. Danger and Flandin found that partially carbonized organic tissues gave similar brown marks, arising from sulphite and phosphite of ammonia; this latter source of error can only be found when the oxidating process has not been continued long enough. The apparatus proposed by the Commission of the Parisian Academy consists of a bottle with a wide mouth, fitted with a cork, through which pass two tubes; one reaches to the bottom of the vessel, and the other is bent, and serves for the purpose of carrying off the generated gases. There is a bulb in the tube to condense the moisture; it is then bent, and communicates with a tube filled with asbestos; another longer tube is attached to this, a part of which is covered with gold leaf, it then passes through a copper screen—it is drawn out to a point at the end. Zinc, water, and sulphuric acid are put into the bottle, and the part of the tube covered with gold leaf is heated to redness; the gas, as it issues out at the fine end, may be inflamed and tested with cold bodies. If no arsenic appears, and the reagents are consequently pure, the suspected solution may be brought into the bottle by means of the tube. The arsenic is deposited on the other side of the heated part. The end of the tube may conduct the gas into a solution of nitrate of silver; metallic silver is precipitated, and arsenious acid remains in solution, which may be tested. If the zinc contain any sulphur, sulphuret of silver is formed. When the ring has been obtained it must be further examined,—

1. As to its volatility. The spots of arsenic exposed to the hydrogen flame volatilize directly; spots of antimony spread at first and vanish after several minutes, having first become much paler.

2. Its change into a volatile white powder, possessed of a garlick smell when heated in a tube open at both ends, and held in a slanting direction.

3. The spots must be treated with a little nitric acid, or rather, aqua regia. The solution, evaporated to dryness, gives with nitrate of silver a brick-red precipitate. The fat spots give light-yellow

\* Louyet drew attention to the fact that several kinds of glass, when heated in the reducing flame of the blowpipe, or of hydrogen, acquire spots which are very similar to those of arsenic, but are easily distinguished by the treatment with nitric acid, and test with solution of silver.—*Journ. de Pharm.* 1840.



precipitates of phosphate of silver, and the residue of antimony remains unchanged.

4. The metallic arsenic may be separated again by mixing the mass with a little black flux and heating in a glass tube.

With Marsh's apparatus weak traces of arsenic spots could be seen when only  $\frac{3}{3,000,000}$  of arsenic were present; with the above described apparatus  $\frac{1}{3,000,000}$  could be observed. No arsenic could be found in organic substances in a normal state, but very easily after the receipt of the poison.

Marsh proposes the following test:—A glass plate, moistened with a solution of ammoniated nitrate of silver, is held horizontally at the distance of half an inch over the burning jet of gas. Arsenic produces the well-known yellow colour, antimony a white precipitate; if neither are present the silver is reduced.

Danger and Flandin have found, that in cases of poisoning by means of antimony, this metal is not to be found in the lungs, nerves, muscles or bones, but chiefly in the liver. The antimony may be separated in the same manner as arsenic; the carbonized organic substance must, however, be extracted with dilute tartaric acid.

Meissner has proposed a method for distinguishing antimoniu-retted hydrogen from the analogous arsenic compound, and also of proving the presence of a small quantity of the former in an excess of the latter. If antimoniu-retted hydrogen be passed through an alcoholic solution of potassa, soda, or ammonia, the colour of the liquid passes from yellow to brown, and metallic antimony is precipitated. Arseniu-retted hydrogen produces no change of colour at all.

Another method of distinguishing whether the metallic ring obtained is arsenic or antimony, is to pass the vapour of iodine into the tube containing it, heat being applied. Iodide of arsenic is of a straw-yellow colour, shining, and of crystalline structure; iodide of antimony is reddish-yellow, dull, and has no crystalline appearance. Water dissolves the former but not the latter.—*Journ. für Prakt. Chem.* xxv. p. 243.

Pettenkofer employs the metallic ring formed in a tube for further experiments as to the presence of arsenic or antimony. The tube is fastened on to a bottle, out of which sulphuretted hydrogen is being evolved. The part of the tube where the ring is situated is heated by the flame of a spirit lamp; the black ring changes into beautiful yellow vapours, which are deposited a little further on. This is pure orpiment.

A ring which had been formed by antimony, when treated in the same manner with sulphuretted hydrogen, gives a kermes red amorphous sulphuret of antimony. This sulphuret is only formed when the ring is heated strongly with the blowpipe, while the arsenic compound only requires a spirit lamp, although it is formed better when the blowpipe is employed. Moreover, the red kermes, when heated for a length of time, becomes gray from its passing into the crystalline sulphuret.

As the sulphuret of arsenic is much more volatile than that of antimony, the orpiment is always deposited further away from the



flame, and the presence of both bodies may be well ascertained. A hydrocarbon prepared from four parts concentrated sulphuric acid and one part alcohol, deposits a ring which appears metallic, which, however, is not altered by sulphuretted hydrogen, and cannot be volatilized. The same behaviour is exhibited by the ring which is deposited when sulphite and phosphite of ammonia, with a little oil of turpentine, are put into Marsh's apparatus. If there is also arsenic present, the orpiment is volatilized, leaving the black ring behind. If a piece of phosphorus be put into the apparatus, a yellow ochre-coloured ring is deposited, which becomes white when heated in sulphuretted hydrogen, and is but little volatile.

Pettenkofer found all officinal preparations of antimony except tartar emetic and powder of algaroth, to contain arsenic.

Rings of arsenic so thin as to be scarcely perceptible to the eye become very evident when treated in this way, inasmuch as they take up  $1\frac{1}{2}$  equivalent of sulphur.

The colour must not be judged of until the tube has cooled; for if the sulphuretted hydrogen be heated strongly and for a length of time, sulphur is deposited, which, however, when cool, has quite a different appearance to orpiment; moreover, the latter is soluble in ammonia, while sulphur is not. The ammoniacal solution may be precipitated with acetic acid, and the sulphuret again put into the Marsh's apparatus, and spots collected which may be volatilized by heat, and examined as to the odour. *Buch. Repert.* xxvi. p. 289.

Phosphoric acid containing arsenic is, according to Wöhler, much more frequently met with than is generally believed, and the arsenic easily escapes observation when it is present in the form of arsenic acid. Before the application of the test with sulphuretted hydrogen it is necessary to boil with sulphurous acid, which reduces the arsenic acid into arsenious acid, or else to use a small Marsh's apparatus. The use of sulphurous acid is strongly recommended by Wöhler in all cases where an oxidizing process has been employed.—*Ann. der Chem. und Pharm.* xxxix. p. 122.

*On the Conversion of Ligneous Fibre into Starch, and on Amyloid.*  
By Prof. J. LIEBIG.

Some time back Dr. Schleiden of Jena published a paper in Pogendorff's 'Annalen' on the conversion of ligneous fibre by means of caustic potash or of sulphuric acid into starch, or some nearly allied substance. Liebig has recently made some experiments on the subject, the results of which show that Schleiden has been deceived by the action of iodine.

When linen or cotton is treated with a mixture of 1 water and 3 sulphuric acid, it assumes a gelatinous state; a sufficient quantity of tincture of iodine quickly added to it imparts to it an intense indigo-blue colour, and on suspending it in pure water it is carried off as a fine blue powder. This experiment is perfectly correct; not so the explanation. The blue colour is not produced, for instance, when previous to the addition of the tincture of iodine the



mixture of sulphuric acid and ligneous fibre is treated with water; in this case only iodine is thrown down. When moreover the blue mass is slightly warmed in water, it loses its colour and cannot again be produced on cooling by the fresh addition of iodine.

When the sulphuric acid is quickly filtered from the ligneous fibre and tincture of iodine added to the clear liquid, a dark blue precipitate is formed, which consequently arises from a substance which had been dissolved by the sulphuric acid; and this substance can in fact be isolated from the solution by the addition of water. It had hitherto been overlooked when acting on fibre with sulphuric acid, and will shortly be more accurately described by M. Hoffmann. The sulphuric acid, separated from the ligneous fibre by means of a funnel stopped with asbestos, is clear and colourless; and, on being treated with water, deposits in pretty considerable quantity a white body in fine flocks; and these it is which were coloured blue by iodine in the experiments of Schleiden. They are insoluble in cold and in boiling water, and when treated alone with tincture of iodine do not assume a blue colour, consequently they do not consist of starch; but they are coloured by iodine when precipitated at the same time with iodine from a solution. This is the case when the sulphuric acid solution is directly mixed with tincture of iodine, in which case the white body and finely divided iodine are thrown down together; but when, as above observed, a few drops of water have been mixed with the sulphate solution, so that the whole of the substance held in solution is precipitated, tincture of iodine no longer gives rise to any colour; if, again, it be redissolved in sulphuric acid, it may be precipitated by tincture of iodine with the blue colour. When the sulphate solution of the white body is kept for twenty-four hours, iodine no longer produces any colouring; but in this case no precipitate is occasioned by water.

It is evident to what false conclusions we are apt to be led respecting the nature of a vegetable substance when founded on nothing else than an accidental colouring, the true nature of which moreover is unknown. Such also is the case with Schleiden's amyloid.—*Ann. der Chem. und Pharm.* xlii. p. 306.

### *On Digestion.*

Bouchardat and Sandras have been led by their experiments to a theory of digestion differing somewhat from that generally adopted. It is a generally received opinion that the food is brought into the stomach and there changed into a homogeneous gray substance of a sweetish, slightly acid taste, which still retains some of the properties of the food, and which has been called chyme. It is supposed that this so-produced chyme passes into the intestines, where it is absorbed by the orifices of the chyloferous vessels and converted into chyle. Bouchardat and Sandras believe that the substance which has been called chyme is a mixture of undissolved remains of the food, the solution of which is perhaps continued in the windings of the intestine, and of excretions from the glands and



mucous membranes of the intestines, which are destined afterwards to form the excrement; but they do not believe that this mixture is expressly prepared for assimilation.

As yet it has been supposed that the food is first dissolved in the stomach, then precipitated and converted into chyme, and finally redissolved, and then forms chyle.

But coloured fibrin gives a colourless chyle; that which is collected during the digestion of starch has very nearly the same constitution as that obtained during the digestion of fibrin.

Is it not, then, very probable that these kinds of food—fibrin, casein, albumen, gluten and starch—are not converted into chyle at all? But the question then comes to be, what are the functions of the vessels containing chyle, and of the chyle itself, which certainly is most abundant during digestion?

Experiments seem to have proved that the openings of the chyloferous vessels are destined to absorb the fatty kinds of food which have been changed into an emulsion by the gall. But this cannot be the sole use of so important a product as chyle. If good food is given to a fasting animal, and is eaten, a process of preparation instantly commences. The saliva collects in large quantities in the cavity of the mouth, as does also the gastric juice in the stomach.

If, however, the gastric juice is produced by the presence of such food, it contains considerable quantities of hydrochloric and lactic acids. These acids are evidently produced by the decomposition of the salts with which the animal œconomy is provided, viz. chloride of sodium and lactate of soda. If, however, we can prove the production of acids we must somewhere or other meet with alkalies.

Whilst the separation of the hydrochloric and lactic acids in the stomach is proceeding, other organs are preparing a chyle for the chyloferous vessels and the ductus thoracicus, the alkaline quality of which is proportional in strength to the quantity of acid produced in the stomach; and this chyle, which is not produced simply by a change and absorption of the food, but by a true secretion, becomes mixed with the blood so as exactly to neutralize the acid which is necessary for the solution of the food. In this way the blood may be continually renewed without undergoing any change whatever.—*Compt. Rend.*, Mai 1842, p. 680.

### *On Glucinium and its Compounds.*

M. Awdejew has made a series of experiments on the salts of glucina, under the direction of H. Rose. Great care was used in the preparation and analysis of the chloride of glucinium. It was found to contain 87.54 per cent. of chlorine; whereas it has been supposed to contain only 66.70. When dissolved in water it forms hydrochlorate of glucina; on evaporating the solution a crystalline mass is obtained which has the composition  $GCl + 4 aq.$  [Awdejew supposes the oxide to contain one atom of oxygen.] The atomic weight of the oxide was determined from the analysis of the



neutral sulphate, which is obtained by dissolving the carbonate in excess of sulphuric acid and separating by alcohol; the salt is precipitated and may be dissolved and recrystallized; its formula is  $\text{GO}, \text{SO}^3 + 4 \text{aq.}$  The atomic weight of glucina is, according to these analyses, 158.084, and that of the metal 58.084. A double sulphate of glucina and potassa may be obtained by gently evaporating a mixture of equal atoms of the two sulphates: it is decomposed by boiling, slowly soluble in cold water. Its formula is  $\text{KO}, \text{SO}^3 + \text{GO}, \text{SO}^3 + 2 \text{aq.}$  It might be  $3 (\text{KO}, \text{SO}^3) + \text{G}^2 \text{O}^3, \text{SO}^3$ , but  $\text{KO}, \text{SO}^3 + \text{G}^2 \text{O}^3, \text{SO}^3$  cannot be formed. The double fluoride of glucinium and potassium was also analysed; it is  $\text{KF} + \text{GF}$ ; it is anhydrous, difficultly soluble. There are three basic sulphates which have been described and analysed by Berzelius (*Lehrbuch*, iv). These formulæ, according to the new equivalent, are  $\text{G}^3 \text{O}^3, \text{SO}^3, \text{G}^2 \text{O}^2, \text{SO}^3, \text{G}^6 \text{O}^6, \text{SO}^3 + 3 \text{aq.}$

In vol. I. of the same Journal Count Schaffgotsch published some experiments on glucina. He analysed the hydrate, and gave as its formula  $\text{G}^2 \text{O}^3 + 8 \text{aq.}$ ; according to the new atomic weight  $\text{G}^3 \text{O}^3 + 4 \text{aq.}$  would agree best with the analysis; the oxide is dissolved by concentrated caustic potassa, and is not precipitated by boiling, unless the solution be diluted, when the whole is thrown down. By boiling the solution of glucina in carbonate of ammonia a granular salt is precipitated, for which Schaffgotsch proposes the formula  $2 (\text{G}^2 \text{O}^3, 3 \text{CO}^2 + 6 \text{HO}) + 3 (\text{G}^2 \text{O}^3, 6 \text{HO})$ ; this complex proportion becomes somewhat more simple if we take the new equivalent, when we find it to be  $\text{GO}, \text{CO}^2, + \text{HO} + 4 (\text{GO}, \text{HO})$ .—*Lond., Edinb. and Dub. Phil. Mag. for October.*

#### *Fluid of the Spina bifida.*

Landerer found this fluid, which was extracted by puncturing, to be clear, inodorous, weakly alkaline, of specific gravity 1.005; it formed a little flocculent precipitate when boiled; it contained albumen, chlorides of sodium, calcium and magnesium, and traces of lactates and phosphates of soda and ammonia; when boiled it gives off a little ammonia.—*Buch. Repert.* xxv. p. 235.

#### *Solubility of Sesquioxide of Iron in Carbonate of Ammonia.*

Wöhler has remarked that freshly precipitated oxide of iron is perfectly soluble in a very large excess of carbonate of ammonia. It has been long known that the hydrated oxides dissolve in the alkaline bicarbonates; however, no particular attention seems to have been paid to this fact, which seems to be a great objection in the analysis of some minerals which contain magnesia and alumina, where carbonate of ammonia is used to precipitate the oxide of iron. Berzelius has however found that if the solution in carbonate of ammonia be sufficiently diluted, every trace of oxide of iron is precipitated; so that on evaporating the ammonia not a trace of iron remains in solution.—Berzelius, *Jahresbericht*.



*Gall-stone of a Sheep.*

Landerer examined one of these concretions. It weighed twelve grains, was outwardly of a brownish yellow colour, inwardly black with green spots. It tasted bitter, and coloured the saliva yellow, fused when heated, swelled up under evolution of a musk-like smell, and left behind a porous charcoal mixed with lime-salts. By means of alcohol Landerer extracted 70 per cent. cholesterine; the residue contained gall-mucus, resin and colouring matter, with phosphate and carbonate of lime.—*Buch. Repert.* xxv. p. 237.

*Action of Sulphuretted Hydrogen on an Acid Solution of Zinc and Arsenic Acid.*

Wöhler found that out of an acid solution the whole of the zinc is precipitated as a yellow powder, which is  $\text{Zn S}$ ,  $\text{As}^2 \text{S}^5$ . If, however, the arsenic acid be first reduced to arsenious acid by means of sulphurous acid, then no sulphuret of zinc is precipitated, but only sulphuret of arsenic,  $\text{As}^2 \text{S}^3$ .

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## ANALYTICAL CHEMISTRY.

*Separation of Chloride of Magnesium from the Chlorides of Potassium and Sodium.*

IN the analysis of minerals and mineral waters it is often a matter of great difficulty to separate the last traces of magnesia from the alkaline chlorides. This however is very easy if the concentrated solution be treated with red oxide of mercury, and the whole evaporated to dryness. The chloride of magnesium and oxide of mercury act on each other, forming magnesia and chloride of mercury, which combines with the alkaline chlorides, forming a soluble double salt. The mass is then extracted with water, the solution evaporated to dryness, and the chloride of mercury driven off by heat. The magnesia is heated red-hot to drive off any undecomposed oxide of mercury. Perhaps lime might be separated from magnesia in the same manner. Berzelius recommends the more frequent use of the preparations of mercury in analytical chemistry. Vauquelin employed nitrate of dioxime of mercury to determine chromic acid; the precipitated chromate being heated to redness, the same method may be employed for determining wolframic and antimonious acids, both of which are generally considered so difficult to separate in a form fitting for their quantitative determination. If we have a solution of either of them in an alkali, we saturate the solution with dilute nitric acid until a precipitate begins to form, and then add the nitrate. For the sake of greater security a small portion of this salt may be precipitated by ammonia, but in general it is not necessary. Theedulcorated precipitate when heated gives wolframic and antimonious acid.



*Separation of Zinc from Nickel and Cobalt.*

The quantitative separation of these oxides is extremely difficult: solution of caustic potassa dissolves out the oxide of zinc, but not perfectly; even if the mixed oxides be repeatedly boiled with caustic potassa the residue always contains a small portion of zinc. The process of heating the oxides in hydrochloric acid gas is also objectionable. Berzelius employs the following method of separation:—The greater part of the oxide of zinc is extracted by caustic potassa, the residue well washed and heated, and then mixed in a porcelain crucible with pure pulverized sugar, and this is carefully carbonized. The crucible is then placed in a larger Hessian one with magnesia, and heated for an hour in a blast furnace as strongly as possible. The oxides are reduced and the zinc is driven off. The cobalt or nickel is dissolved in nitric acid, evaporated to dryness in a platinum crucible and heated. The loss of weight gives the quantity of oxide of zinc. The principal point to be attended to is to extract all the potassa from the mixed oxides: it is best to test for it after they have been heated.

*Another method by Ullgren.*

The oxides of nickel, cobalt and zinc are precipitated by carbonate of soda, the whole evaporated, and the residue gently heated, so that they remain perfectly insoluble when the mass is treated with water. The oxides are washed and dried, and then being placed in a tube with a bulb, are reduced by means of hydrogen; but it must take place at a very low red heat; the mass is allowed to cool, while a continual current of hydrogen is passed through. The tube is now melted to at one end, and then filled with a concentrated solution of carbonate of ammonia, corked up, and allowed to stand twenty-four hours at a gentle heat, *i. e.*  $40^{\circ}$  C. The oxide of zinc which is not reduced is dissolved in the carbonate, and the nickel and cobalt areedulcorated with it. The ammoniacal solution when evaporated leaves the oxide of zinc behind, which may be heated and weighed. The oxides before being reduced must be finely pulverized.

*Separation of Magnesia from the Oxides of Cobalt and Nickel.*

Ullgren separates these oxides as follows:—The solution is precipitated by a mixture of chloride of lime and potassa; by this means cobalt and nickel are precipitated as superoxides, mixed or combined with magnesia. The precipitate isedulcorated and digested while still moist, at a temperature of  $30^{\circ}$  or  $40^{\circ}$ , with a solution of corrosive sublimate in excess. A double salt,  $\text{Mg Cl} + 3 \text{Hg Cl}$ , is formed, while an equivalent quantity of basic chloride of mercury is precipitated; the solution and washings are evaporated in a porcelain crucible, the chloride of mercury driven out by heat, and the residue dissolved in nitric acid; the nitrate of magnesia may then be evaporated and heated red-hot. The oxides of nickel and



cobalt must be heated to drive off the mercury, and may then be separated as usual.

### *Separation of Nickel and Cobalt from Manganese.*

Ullgren precipitates the metals from their solution as superoxides by means of chloride of lime. A small quantity of manganic acid remains in solution, but this is easily precipitated by adding alcohol to the filtered solution, and boiling. The edulcorated superoxides are then dissolved in pure dilute hydrofluoric acid in a platinum vessel, ammonia added in excess, and the mixture heated nearly to boiling. During the solution in hydrofluoric acid oxygen is evolved, and a portion of the fluoride of manganese is converted into superfluoride. The ammonia when heated decomposes this as well as a portion of the fluoride of cobalt, so that oxide of manganese alone is precipitated, and nickel and cobalt remain dissolved. It is necessary, for filtering the solution and washing out the oxide of manganese, to use a funnel of pure silver, as also to filter into a vessel of platinum. The oxide of manganese is thus obtained quite free from cobalt and nickel. The solution is evaporated, the fluorine driven out by means of sulphuric acid, &c.

### *Separation of Lead from Bismuth.*

Ullgren precipitates the oxides with carbonate of ammonia and dissolves them in acetic acid; a strip of clean lead, the weight of which is known, is then put into this solution, so that the whole of it is covered. The vessel is closed and allowed to stand for some hours. Bismuth is separated in a metallic state, that which remains on the lead is washed off, and the strip dried and weighed. The bismuth is brought into a filter and washed with water which has been boiled and allowed to cool; it is then dissolved in nitric acid, evaporated, heated, and the oxide of bismuth weighed. The solution of lead is precipitated with carbonate of ammonia, and the oxide determined. The loss of weight which the lead has suffered gives the quantity of oxide of lead which was not originally in the solution.

The above notices are taken from Berzelius' '*Jahresbericht*,' 21.

A substance which promises to be of essential service in analytical chemistry is the cyanide of potassium, as it affords a safe and easy means of separating certain classes of metals and earths. A paper on this subject will appear in our next Number.

### *Test for Iodine.*

Steinberg proposes the following test for iodine, as extremely delicate and easy of execution:—The liquor in which iodine is supposed to be contained is put into a watch-glass, and a little solution of starch dropped on it, the platina wire of the positive pole of a galvanic battery is then put through the starch, and the negative wire put into the solution. After a few moments the well-known



intense blue colour appears ; and this is not prevented by the presence of a large quantity of chloride or bromide.—*Journ. für Prakt. Chem.*, xxv. p. 387.

### *Test for Copper.*

Virgain makes the solution slightly acid, and puts a drop of it on to a piece of polished platinum foil, and then places a piece of iron so that it touches both the liquid and the platinum ; the copper is precipitated in a metallic state on to the platinum.—*Journ. de Pharm.* 1841.

## PHARMACOLOGY.

### *Adulteration of Saffron.*

WINCKLER and Gruner propose to detect safflower and the petals of marigolds (*Calendula*), with which this drug is often intentionally mixed, by means of a solution of silver or of perchloride of iron. The infusion of true saffron is not altered by either reagent, but the extract of either of the above-mentioned adulterations is rendered opake, and at length precipitated.—*Jahrbuch für Prakt. Pharm.* 1842, p. 73.

### *On the Barks of Commerce.*

We have selected for our present Number, under the head “Pharmacology,” a valuable article on the barks, forming one of an extensive series of papers on drugs, which we intend bringing before our readers. The best treatise on the present subject in the English language is contained in Dr. Pereira’s important work on *Materia Medica*, which will be in the hands of most of our readers ; and it is hoped that the present contribution will form a valuable appendix to what is therein contained. We have employed the Latin and English names of Dr. Pereira, giving at the same time the German, which may prove of value to those engaged in the trade. In making use of the termination *ine* instead of *a*—for instance, quinine for quina,—we are following a plan laid down by Berzelius for the vegetable alkalies, and one which is generally employed by continental authors, and by many chemists in this country ; we trust we shall not, on this account, be thought possessed of any love of innovation.

### I. CINCHONA HUAMALIES ; *Huamalies*, or *Rusty Bark* ; *Huamalies-china*, Germ.

The statements respecting the amount of alkaloids contained in this bark vary so much as to render it worthy of more particular attention. Three kinds of Huamalies have been submitted to examination by M. Winckler,—1, in thick quills and heavy curved pieces from an original chest ; 2, in moderately-sized quills, with



the surface covered for the greater part with its epidermis ; and 3, the sort which generally occurs mixed with *Loxa* or *Crown bark*, in middling fine quills. The latter was carefully selected from an original package of *Loxa Cinchona* :—

1.	2.	3.
1000 grains.	1000 grains.	13 ounces.
8.58 gr. pure cinchonine.	1 gr. cinchonine.	7 gr. cinchonine.
3.00 gr. quinine, still mixed with some impure cinchonine.	7 gr. kinova bitter*.	0.5 gr. quinine †.
3.25 gr. kinova bitter.	28 gr. resin.	
8.00 gr. resin.		

The following was the method employed to separate the alkaloids :—1000 grains of the finely powdered bark was extracted with a mixture of 30 grains pure concentrated sulphuric acid, and 8 ounces water, in the water-bath, the extract removed, and the residue treated again with a mixture of 10 grains sulphuric acid and 8 ounces water. The extracts united, clarified by settling, poured off from the sediment, and digested at a moderate temperature with six drachms, fresh prepared, finely powdered hydrate of lime, until entirely decomposed. The edulcorated, dried and powdered lime precipitate was then boiled repeatedly with the requisite quantity of alcohol of 0.863 sp. gr., to which some pure animal charcoal had been added, to extract the alkaloid which was thus obtained on evaporating the alcohol in a nearly pure state, and after drying in the water-bath, was weighed. When the barks abound in resin, the alkaloid, especially if it be quinine, frequently contains, by this process, some resin ; this cannot be detected, from the action of the residue. In this case the alkali was separated from the resin by dissolving it in very dilute acetic acid, and precipitating with a solution of ammonia, then dried and weighed. The separation of the cinchonine and quinine was effected by allowing the greater part of the

\* Which gave rise to the excessively bitter taste of the bark ; a proof that this can never be depended on as a test of the goodness of bark.

As no mention of this substance is made in the last edition (1842) of Dr. Pereira's work, we have extracted the following short account from Berzelius's '*Lehrbuch*,' vol. vii. p. 403 :—

"This peculiar crystalline substance was first discovered by M. Winckler in *Cinchona nova*, when extracting the bark with æther, in one of Robiquet's displacement apparatus. The æther is distilled off, and the residue treated with alcohol of 0.863 sp. gr., in which it is very soluble. The greater part of the alcohol is driven off, and a small quantity of ammonia added, to fix the kinovic acid, and then precipitated with water. A milky-white powder is deposited, which is the kinova bitter. It cannot be sublimed, does not combine with bases or with acids, although soluble in hydrochloric acid, as well as in caustic potash, when boiled with them. Buchner, jun. subsequently proved the identity of this substance with Smilacine, with which it agrees in its physical properties as well as in its composition. It contains 62.56 Carbon, 8.70 Hydrogen, 28.73 Oxygen."

† Small quantities of quinine are best detected by dissolving from a quarter to half a grain of the extracted alkali in a small white test-tube, in an excess of very dilute sulphuric acid. If only a trace of quinine be present the peculiar blue opakeness renders it perceptible, even though the alkali is still impure, and the solution of the bisulphate more or less coloured yellow on that account.



cinchonine to crystallize out of the alcoholic solution of the alkalies extracted in the above manner, and treating the residue with æther, in which cinchonine is very slightly soluble. For the sake of comparison, equal quantities of several kinds of cinchona bark were extracted completely with alcohol of 0.863 sp. gr., the tinctures treated with hydrate of lime, until a solution of the perchloride of iron no longer afforded any reaction, the filtrated alcoholic solution which had been previously decolorized with animal charcoal, evaporated in the water-bath, the residue treated with very dilute acetic acid, in order to remove the resin and kinova bitter, and the alkali precipitated with ammonia from the previously filtrated solution of the acetate.

In most cases, especially with barks rich in alkali, the result agreed exceedingly well with that obtained by extracting with acidulated water, &c.; in barks containing but little alkali the treatment with alcohol, &c. has decidedly the preference. Besides, this process has the advantage, that the amount of kinova bitter may be determined, at least approximately, at the same time; as the bitter is dissolved, on treating the residue, previously extracted with acid, with æther, still in combination, it is true, with a yellow colouring substance from which it is difficult to separate, while the resin remains undissolved. In the examination of the Huamalies barks this method was employed to determine the amount of kinova bitter; if it is wished to determine this accurately, it is preferable to extract the finely powdered bark immediately with absolute æther, to evaporate the solution, treat the residue with strong alcohol, decolorize the solution with charcoal, and to leave the filtrated solution to spontaneous evaporation.

When but a small quantity of bark is at hand a mixture of about 60 grains of the powdered bark, with as much hydrate of lime, and 30 grains animal charcoal, is extracted with the requisite quantity of alcohol, and the residue remaining after evaporation of the filtrated alcoholic extract treated with acetic acid, &c. By this method any loss of alkali is possibly avoided.

## II. CINCHONA CARTHAGENA, S. FLAVA DURA; *Carthagenæ Hard Cinchona. China flava dura*, Germ.

This kind of cinchona belongs to those barks which are poor in alkalies. From a collection of 40 samples of good cinchona 30 agreed well with one another, and belong to the above bark. Some of the kinds not belonging here afforded only cinchonine, but agreed in their physical characters more with *Cinchona rubiginosa* than the true *Cinchona flava fibrosa*, which, according to Winckler's experience, likewise contains cinchonine only, is very similar, especially the flat pieces, to the *Cinchona regia*, but seldom occurs in commerce. 94 ounces of the hard yellow cinchona afforded:

Cinchonine, 78 gr.

Quinine, 14 gr.

This bark contains, moreover, a considerable quantity of kinova bitter, of which a portion was separated by concentration and precipitating with hydrochloric acid from the solution filtered from the lime precipitate.



Between this bark and the *Cinchona flava fibrosa* stands that kind of cinchona which was previously described by Winckler as *Cusco cinchona*. In its physical properties it bears much resemblance to the *Cinchona rubiginosa* and *Cinchona flava fibrosa*, but is easily distinguished when seen in mass by its grayish brown colour. It differs from the *Cinchona carthagena dura* by the softer consistency of the substance (the rete mucosum and cortical layers). In thin quills, which are however of rare occurrence, it resembles, to deception, the true Cusco bark.

This bark is very rich in alkali; Winckler formerly obtained it from a well-known wholesale druggist under the name of *Cusco china*, but subsequently from a different source as *Cinchona flava Cusco*, which latter name he considers most proper, from its containing, beside cinchonine and quinine, a considerable quantity of a third alkaloid agreeing with that to be subsequently described under Cusco bark.

Thirty-three ounces of bark afforded 260 grs. of raw alkali, which by re-dissolving in boiling alcohol was separated into cinchonine, quinine (almost in equal proportions), and a small quantity of the new alkali. This bark, which is scarcely known, belongs, therefore, to the best kinds, and approaches nearest in amount of alkali to *Cinchona rubra*. In this latter bark a considerable quantity of kinova bitter was also found.

[To be continued.]

## CHEMICAL PREPARATIONS.

### *Preparation of finely divided Calomel.*

SOUBEIRAN proposes the following method as much better than that with steam, being very much easier to execute and equally efficacious as regards the beauty of the preparation. The calomel is heated in an earthen tube in a furnace, and a current of air is directed uninterruptedly into the tube by means of a small ventilator. This sweeps away, as it were, the vapours of calomel, and in a straight tube will carry them a distance of 60 feet, to avoid which the end of the recipient enters into water, by which means the calomel is moistened and falls down.—*Compt. Rend.* 1842, Mai, p. 665.

Righini has found that by the long-continued action of steam upon finely-powdered calomel a small portion of corrosive sublimate is formed.—*Journ. de Chim. Med.*, Avril 1842, p. 190.

### *Preparation of Hyperchloric Acid.*

In the preparation of this acid from hyperchlorate of potassa, the sulphuric acid employed is generally diluted with water. Nativelle has shown that this is very objectionable, and proposes the following method:—500 parts of finely pulverized hyperchlorate of potassa are put into a retort, and 1000 parts of sulphuric acid of 66° (sp. gr. 1.848)



diluted with 100 parts of distilled water are added. A receiver is adjusted without any lute of paper or other organic matter; if any be used it should be of asbestos. As hyperchloric acid is volatilized at  $140^{\circ}$ , it is better not to let the mixture boil; by this means sulphuric acid is prevented from passing over. If the residue in the retort becomes colourless and no more drops pass over although the temperature is high, then the operation is finished. In this way 300 parts of impure acid are obtained, sp. gr. 1.455. If the distillation has been conducted too rapidly it contains sulphuric acid, and has a higher specific gravity. In order to free it from chlorine and sulphuric acid, it is shaken with a small excess of sulphate of silver. The filtered solution is mixed with newly precipitated carbonate of baryta until all the sulphuric acid is saturated and only a little hyperchlorate of baryta is formed. The filtered acid, containing silver and baryta, is then distilled at a gentle heat, and the water which passes over first received by itself until it has an acid reaction. The distillation may be conducted to dryness. The acid thus obtained is pure, colourless and transparent. Its specific weight lies between 1.117 and 1.824; it is oily like sulphuric acid. From 500 parts of hyperchlorate Nativelle obtained 150 parts of pure acid.—*Journ. de Pharm.* 1842, i. p. 498.

#### *Pure Sulphuric Acid.*

Jacquelin prepares pure sulphuric acid for accurate analyses and as a toxicological test, by first purifying the acid with sulphur; he then adds a small quantity of solution of chlorine to it, and boils it for some minutes. The acid is then perfectly free from sulphurous, nitric and hydrochloric acids. He considers sulphate of protoxide of iron to be the best test for detecting traces of the oxides of nitrogen in sulphuric acid. He takes at least 50 grammes, about 750 grains of sulphuric acid, and pours on to it 7 grains of distilled water, allows it to cool, and then adds 10 drops of the sulphate, stirring the mixture to prevent much heat being evolved.—*Ibid.*, Mai 1842.

#### *Preparation of Chloride of Zinc according to Righini.*

Dissolve 80 grm. of pure crystallized chloride of barium, and 98.6 crystallized sulphate of zinc, each in 750 grm. distilled water; pour both solutions together into a flask, and heat for a time in the water-bath; strain and evaporate to 60 grm.; strain again through a filter covered with animal charcoal mixed with some powder of chloride of barium, and then evaporate until the liquid left to itself solidifies in white crystalline flocks, which are dried and preserved in closely-stoppered bottles.—*Gaz. des Hôpitaux*, t. iv. No. 86.

#### *Preparation of pure Potassa and Soda.*

The best method of preparing caustic baryta is, as is well known, by decomposing sulphuret of barium with oxide of copper. The



easy preparation of it has induced Dr. Schubert to propose the following plan for preparing pure potassa or soda. He dissolves crystals of neutral sulphate of potassa, or effloresced sulphate of soda, in a very concentrated solution of caustic baryta, until chloride of barium causes no precipitate in a filtered portion; he then adds carefully a dilute solution of baryta, and then, if necessary, dilute sulphate, until neither baryta nor sulphuric acid is contained in the solution. If there is excess of baryta it will fall as carbonate on evaporating the solution, but this induces the necessity of re-solution and evaporation, by which the alkalies absorb carbonic acid.—*Journ. für Prakt. Chem.*, xxvi. 117.

*Louvier's Unguentum contra Tineam.*

This salve consists of 6 parts soda, 40 parts slacked lime, and 1200 auxungia. After the hair has been cut, the crusts softened, and all the places cleansed with soap and water, this salve is rubbed in daily, care always being taken that the parts are kept clean. Subsequently a powder, consisting of 15 parts caustic lime and 1 part charcoal, is strewed among the hairs, which so destroys the roots that the hair may be removed with the pincers without pain. When this has been done the embrocations are continued until the skin has acquired its usual colour.—*Journ. de Pharm.* 1842, p. 65.

*Employment of Sulphuret of Iron in Cutaneous Diseases.*

Sulphuret of iron has lately been used by Cazonave in cutaneous diseases, in the form of extremely fine powder suspended in 60 parts of *Syrupus saponariæ*.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*Theory of Saponification.* By Prof. LIEBIG.

WHAT was known of the nature of saponification, previous to the commencement of the present century, amounted to nothing, excepting the important discovery, by Scheele, of the *sugar of fats*, now called the *hydrated oxide of glyceryle*. Chevreul began, in 1813, a series of investigations on soaps, which have not only thrown a clear light on this portion of chemistry, but have also led the way to the most brilliant discoveries in the whole province of organic chemistry. We are indebted to him for the present predominating principle in all organic researches, viz. to subject a body to a series of changes, and to ground its composition on their ascertained connexion.

Chevreul proved that all fats comprehended under the terms grease, oil and tallow, consist of three materials united in the most varied proportions, one of which, *oleine*, at common temperatures, and



below  $32^{\circ}$  Fahr., is always fluid, the others solid, the one called *stearine*, the other *margarine*—distinguished from each other by their melting points and the different acids they give rise to by decomposition. These fatty substances are each composed of a peculiar fat acid, united to a compound oxide, the oxide of glyceryle, and being salts, are subject to decomposition, like ordinary salts.

Decomposition ensues when a fat, *i.e.* a compound of oxide of glyceryle, is treated with an alkali, or with oxide of lead or zinc; the alkalies, or metallic oxides, combining with the fat acid—the former constituting soluble salts or soap, the latter insoluble salts or plasters. The oxide of glyceryle, at the moment of its separation from the fat acids, takes up water and forms hydrated oxide of glyceryle.

The weight of the hydrate of glyceryle, added to that of the hydrated fat acids, amounts to more than the weight of the fat employed; the increased weight arising from the water entering into combination with the glyceryle and fat acids.

In the saponification of fats by alkalies no other products are formed, and the operation is conducted equally well *in vacuo*, or in the air. With strong alkaline lyes, the soap separates from the concentrated fluid, and collects on its surface, while the glyceryle remains dissolved in the alkaline solution. The soap remains dissolved in a weak and hot alkaline lye, but on cooling the whole congeals to a gelatinous translucent mass.

Soaps are *solid and hard*, or *soft*. The latter are obtained from drying oils, and contain potassa as a base; and to give them more consistence tallow and fat oils are added, which form solid soaps. The hard soaps contain soda, and are prepared with fat oils, tallow, &c.

Soda soaps are made in England and France directly by soda and fats, in Germany by decomposing potash soaps with chloride of sodium. Commercial soaps from vegetable fats consist of oleated and margarated alkalies; those from animal fats are salts of stearic, margaric and oleic acids, with an alkaline base.

Potassa and soda soaps are readily soluble in hot water and alcohol; the addition of a quantity of water to the aqueous solution produces a precipitation, the neutral salts of stearic and margaric acids decomposing into free alkali, which remains in solution; and acid stearate and margarate of alkali, which precipitate in the form of pearly crystalline scales.

Potassa soaps are more soluble in water than those containing soda. Stearate of soda may be regarded as the type of hard soaps, and when in contact with ten times as much water it suffers no striking change. Stearate of potassa forms a thick paste with the same quantity of water. Oleate of soda is soluble in ten parts of water; the oleate of potassa dissolves in four parts, and forms a jelly with two parts, and possesses such a strong affinity for water, that 100 parts absorb 162 in a moist atmosphere. Margaric acid acts similarly to stearic. It follows from this that soaps are soft in proportion to the oleates, and hard in proportion to the stearates and



margarates they contain. Soda soap exhibits a peculiar behaviour to a solution of common salt; it loses the power of being penetrated by, or dissolving in, a solution of salt of a certain strength, and this remarkable action is an important condition in its manufacture, on which depends the separation of all free alkali and oxide of glyceryle, its content of water, and the state in which it is brought into the market.

If a piece of common hard soap, cut into pieces, be put into a saturated solution of salt, at ordinary temperatures, it swims upon the surface without being moistened, and if heated to boiling it separates without foam into gelatinous flocculæ, which collect on the surface, and upon cooling unite into a solid mass, from which the solution flows off like water from fat. If the flocculæ be taken out of the hot fluid they congeal on cooling into an opaque mass, which may be pressed between the fingers into fine laminæ without adhering to them. If the solution be not quite saturated, the soap then takes up a certain quantity of water, and the flocculæ separate through the fluid in boiling. But even when the water contains  $\frac{1}{400}$  of common salt, boiling produces no solution.

If the soap be boiled in a dilute and alkaline solution of salt and suffered to cool, it again collects on the fluid in a more or less solid state, depending on the greater or less concentration of the solution, *i. e.* on the quantity of water taken up by the soap. By boiling the dilute salt solution with soap for a considerable time the watery flocculæ swell up, and the mixture assumes a foaming appearance; but still they are not dissolved, for the solution separates from them. The flocculæ, however, have become soft and pasty even after cooling, and their clamminess depends more or less upon the quantity of water they have taken up. By still continued boiling this character again changes, and in proportion as the water evaporating renders the solution more concentrated, the latter again extracts the water from the flocculæ; the liquid continues to foam, but the bubbles are larger. At length a point is attained when the solution becomes saturated; before this, large iridescent bubbles are observed to form, and in a short time all foam disappears; the liquid continues boiling without foam, all the soap collects in a translucent mass on the surface, and now the solution and soap cease to attract water from each other. If the plastic soap be now removed and cooled, while the solution is pressed out, it has become so solid as scarcely to receive an impression from the fingers. In this state it is called *grain-soap* (*Kernseife*).

The addition of salt, or its solution, to a concentrated alkaline solution of soap in water, precipitates the soap in gelatinous flocculæ, and the mixture behaves precisely like solid soap boiled with a dilute solution of salt. Carbonated and caustic potassa act exactly like salt, by separating soap from the alkaline fluid, in which it is absolutely insoluble.

The application of the above to the manufacture of soap is evident. The fat is kept boiling in an alkaline lye until all pasty matter disappears, but the lye should only have a certain strength, so



that the soap may be perfectly dissolved in it. Thus tallow may be boiled for days in a caustic potassa-lye, of spec. grav. 1.25, without saponification; if the lye be stronger a partial saponification takes place, but being insoluble in the fluid, it floats upon the surface in a solid mass; by the gradual addition of water and continued boiling, at a certain point the mass suddenly becomes thick and clammy, and with more water a kind of emulsion is formed (*Seifenleim*), which continued heating renders perfectly clear and transparent if a sufficient quantity of alkali be present. In this state it may be drawn into long threads, which on cooling either remain transparent, or are more milky and gelatinous. As long as the hot mass suffered to drop from a spatula exhibits a cloudiness, or opalescence, the boiling is continued, or more alkali added. When excess of alkali is present, the cloudiness arises from imperfect saponification, or want of water; the former is shown by dissolving a little in pure water, which becomes perfectly clear when the whole is saponified; if the lye contain lime, the mixture is also clouded, but the addition of carbonated alkali instantly clarifies it.

In order to separate the soap from water, free alkali and oxide of glyceryle, a large quantity of salt is gradually added to the boiling mass, on each addition waiting until it is dissolved; the first addition increases the consistency of the mass, while each successive portion renders it more fluid, till it loses its threading character, and drops from the spatula in short thick lumps. As soon as the congelation is complete, *i. e.* when gelatinous flocculæ separate from a clear watery liquid, the fire is extinguished, the soap suffered to collect on the surface, and cooled either on the liquid, or ladled out, and suffered to get solid.

In the former case it contains water, free alkali, and other impurities of the lye, and is therefore ill adapted for commerce, although sufficiently good for domestic purposes. As in other chemical operations a precipitate is purified by boiling it in a fluid in which it is insoluble, so soap is purified by a solution of salt rendered alkaline.

The soap of the first boiling is either re-dissolved in weak alkaline lye, and precipitated by salt several times, or it is boiled with an alkaline solution of salt several times, by which means it is rendered much purer. When the saponified fluid is made with potassa, the salt (chloride of sodium) operates in a two-fold manner: it dissolves in the pasty liquid, and decomposes with the potassa salts of the fat acids, forming on the one side chloride of potassium, and on the other soda or soda-soap. That a decomposition takes place is evident from the altered consistency of the fluid mass. Since chloride of potassium has not the property of separating soda-soap, a larger quantity of salt is added. When potassa-lye is employed in soap-making, the first salting requires more than twice the quantity of salt.

In the preparation of potash soaps, a concentrated potassa-lye is employed for separating the soap. Acetate or tartrate of potassa may be employed on a small scale. In the manufacture of soaps,



the saponification of the fats is not completed by the first treatment with weak lyes; and the subsequent repetition of fresh lyes, beside purifying, also renders saponification more perfect.

In saponifying olive and other oils, the mixture often attaches itself to the bottom of the vessel, and is burned; in these cases the alkaline lye is previously mingled with salt, so that the forming soap is obtained in a state of fine division, and yet prevented from forming a perfect solution. For common house use, soap of the first boil is only treated once with salt; that for commercial purposes is suffered to swell up in a weak salt lye, by means of which it takes up fifteen to twenty per cent. water. Grain soap (*Kernseife* of the Germans) is generally coloured bluish or greenish, from sulphuret of iron, or copper, or from iron or copper-soaps. By cooling these colouring matters collect more or less in certain points, which gives a marbled appearance to the hard soap. Marbling is generally produced by the addition of sulphate of iron or peroxide of iron to the still soft mass.

For white soap, it is rendered fluid by heating it in a saline alkaline lye, and kept in the covered vessel until all the colouring matters have subsided. The more water the soap has taken up in this operation, the more perfect the separation of the impurities, the whiter the soap. Now since this water is not separated, but sold in the soap, it follows that it has much less real value than the grain soap. The white soap contains from forty-five to seventy, marbled soap from twenty-five to thirty-five per cent. water.

The manufacture of soft soap is the simplest of all. The drying oils, either alone or mixed with train oil, tallow and other fats, are kept boiling with dilute potassa-lye until the saponification is completed, *i.e.* a mass is formed which draws into long transparent threads. Particular care is paid in its preparation to the dilution of the lye, for all soft soaps are insoluble in moderately strong potassa-lye, and may be precipitated from their solution by the addition of strong lyes. The fluid would therefore appear cloudy, milky, with an excess of strong lye, and by adding water would become pasty or gelatinous. A deficiency of alkali produces an acid oleate of potassa, which attaches itself in thick masses to the bottom of the vessel; but an addition of lye changes it into a neutral salt. Oxide of glyceryle is not separated from soap, although it might be done by the final use of strong alkaline lyes.

The soft soaps of commerce have a greenish or greenish-brown colour; they are transparent in thin laminae, shining, soft but not fatty to the touch, of a peculiar odour, and have an alkaline reaction. Tallow is often added to them, which disseminates crystalline particles of stearate of potassa, communicating to them a peculiar grained character. Chevreul and Thenard found in commercial soft soap 39.2 to 44 per cent. oleic and margaric acids, 8.8 to 9.5 potassa, and 46.5 to 52 water. They always contain hydrated oxide of glyceryle and delphinate of potassa, derived from train oil, whence their peculiar odour.

When an alkaline soap is mingled with an earthy or metallic salt,



voluminous white or coloured precipitates ensue, in which the alkali is replaced by the earth or metallic oxide. Thus the salts of lime, magnesia, &c. throw down lime, magnesia, &c. soaps. Hence the curdling appearance, when soap is used with hard waters, arises from the union of the lime or magnesia they contain with the fat acids. If carbonate of lime be in the water, it may be thrown down by a little caustic potassa or lime, which will render it softer; if sulphate of lime or a magnesia salt be present, pearlash (ash-lye) will separate the earths.—*Ann. der Chem. und Pharm.* xxxvii. 249.

### *Preparation of Ultramarine.*

Tirnmon has given a receipt for the preparation of this substance which differs from those generally employed, inasmuch as a small quantity of arsenic is added to the sulphur.

The quantities employed are:—

Clay, very finely sifted .....	100
Gelatinous alumina, containing anhydrous alumina	7
Carbonate of soda, crystallized .....	1075
Flowers of sulphur .....	221
Orpiment .....	5

These substances must be mixed together with the greatest care, the pulverized orpiment is shaken into the carbonate of soda fused in its water of crystallization, and when this is partly decomposed the alumina is added: this latter is obtained by precipitating common alum with carbonate of soda, and washing once with river water. The clay and flowers of sulphur are then added, and the whole placed in a covered crucible, which is slowly warmed, in order to drive off the water; as soon as this is effected it is heated red hot. The heat must be so regulated that the mass sinters together without fusing. It is then pulverized, and suspended in river water, and brought upon a filter. If the ingredients have been well mixed the whole mass may be used, but if not there will be several colourless parts; and if the heat has been raised to fusion there will be brown parts, and more especially when the crucible is of a bad kind and easily destroyed. These appearances however are never seen if the operation has been well conducted. The substance on the filter is notedulcorated. The product has now a beautiful delicate green, or even bluish colour. It is then to be heated in a covered dish, and stirred about from time to time. The temperature may be allowed to rise to a low red heat; it may be kept at this temperature for one or two hours.—*Compt. Rend.*, Mai 1842, p. 761.

Dr. Elsner has published an extensive series of experiments which he made to determine what is really the cause of the blue or green colour of ultramarine. It is well known that the natural lapis lazuli, as well as the artificial, evolves sulphuretted hydrogen when treated with hydrochloric acid, and thereby loses its colour. It would appear, therefore, that the sulphur is the cause of the colour, particularly as this body is always found in artificial ultramarine. Elsner made a large number of experiments, passing sulphuretted hydro-



gen over alumina, carbonate of soda, silica and alumina, or over a mixture of all these bodies, but in no case could any other colour than yellow or reddish be obtained, if pure materials were employed; on the other hand, if a very minute portion of iron be added, a green, blue or black colour is produced. Elsner then proceeded to another series of experiments. He heated in a furnace mixtures of "ultramarine base" (consisting of silica, alumina and carbonate of soda) with sulphur. It was found that when the ingredients were pure no colour was produced, but only when they contained iron: flowers of sulphur and ordinary alum both contain traces of iron (the iron in Tirnmon's preparation is probably derivable from the latter substance). He therefore concludes from all his experiments, that ultramarin must contain sulphuret of iron and also sulphuret of sodium; this latter compound appears frequently to be a higher sulphuret, inasmuch as when treated with acid free sulphur is left behind, while sulphuretted hydrogen is evolved. Elsner finds that a greenish ultramarin may be converted, by carefully heating it in an open vessel, into a blue one, and he is inclined to refer the change to the formation of a higher sulphuret, for he has obtained more free sulphur from the blue than from the green varieties.

It is necessary, in examining the composition of an ultramarin, to make two experiments to determine the sulphur; one with nitric acid, by which the whole quantity is obtained; the other with hydrochloric acid, by which the sulphur of the simple sulphurets is found. With lime, strontia and baryta, similar ultramarins may be obtained. Elsner has given the means of several analyses of the blue and green varieties, to which are subjoined the analyses of a natural lapis lazuli, and of an artificial product by Varrentrapp:—

	Lapis lazuli.	Artificial from Meissen.	Elsner.	
			Blue.	Green.
Potassa . . . . .	..	1.75		
Soda . . . . .	9.09	21.47	40.0	25.5
Alumina . . . .	31.67	23.30	29.5	30.0
Silica . . . . .	45.50	45.00	40.0	39.9
Sulphur . . . . .	0.95	1.68	4.0	4.6
Lime . . . . .	3.52	0.02		
Iron . . . . .	0.86	1.06	1.0	0.9
Chlorine . . . .	0.42			
Sulphuric acid	5.89	3.83	3.4	0.4
Water . . . . .	0.12			

*Journ. für Prakt. Chem.*, xxiv. and xxvi.

## REVIEWS.

*Elements of Chemical Analysis, Inorganic and Organic.* By EDWARD ANDREW PARNELL, Chemical Assistant in University College, London. 1 vol. 8vo. Taylor and Walton.

It is difficult to say whether the benefits of a good practical elementary work on chemical analysis are likely to be most felt by the



teacher of the science or the student: the difficulties which beset the path of the learner in this most important branch of chemistry are so numerous, and the calls on the personal attention of the teacher so frequent, as often to lead in a great measure to the neglect of this truly fundamental part of the study, by the diligent and untiring cultivation of which the pupil may alone hope to attain such a proficiency in manipulation and acquaintance with the resources of the science as shall hereafter put him in a state to attempt with success original investigation. If there be any portion of the discipline of the laboratory more fitted than another to rivet upon the mind of the student the conviction of the absolute necessity of the utmost care, circumspection, order and neatness in the general business of chemistry, it is surely an early and familiar acquaintance with the details of mineral analysis in its most perfect forms.

As an adjunct to the exertions of the teacher, but by no means superseding the necessity of oral and practical instruction, the work of Mr. Parnell appears likely to be in the highest degree useful; it will serve to convey to the attentive student a correct notion of the general routine of operations proper to each of the different classes of analytical research, and the principles upon which such modes of proceeding have been devised, besides affording him a fund of practical detail, an easy reference to which will certainly lighten his labours and accelerate his progress.

The best work on analytical chemistry is Heinrich Rose's 'Handbuch' (a translation of one of the earlier editions by Mr. Griffin has appeared in English): but this work is by no means fitted for the student; it is intended more for the proficient than the learner; the various processes and reactions are discussed at a length which would only confuse a beginner, while the author presumes that all the practical manipulations required in analytical chemistry are fully known to the reader. It is in supplying this deficiency that Mr. Parnell's book promises to be of value. He has selected from Rose those portions most likely to be useful to the junior student, and has added a variety of interesting and useful matter not to be found in the great work referred to.

After briefly describing the ordinary manipulations in use and the management of the instruments commonly employed, the author proceeds to point out, by the aid of a comprehensive and well-arranged set of tables, the effects produced under different circumstances by various "reagents" on the oxides and acids which ordinarily come under the notice of the chemist. These tables have been evidently drawn up with great care, and they well deserve it, since it is by the aid of such that the pupil most easily becomes familiar with the practice of testing for acids and bases, the most elementary operations of qualitative analysis. The more difficult part of this subject, the qualitative examination of substances of complicated nature, is then discussed, including the case of silicates which are not attacked by the common acids. Much of the information here given is put into a tabular and exceedingly condensed and convenient form.



The use of the blowpipe next follows; the construction and management of this useful instrument are described, and copious tables of the effects of the inner and outer flames on the different oxides and salts added.

Some remarks on the methods of detecting certain poisonous substances, such as arsenic, mercury, lead, &c., when complicated by the presence of organic mixtures, and the examination of wine for the purpose of discovering a departure from a normal condition, terminate the first half of the work.

Quantitative analysis, or investigations involving weighed results, is then discussed; the general routine of the operations and the precautions necessary to guard against failure are spoken off, and the special details of the modes of separation of different substances from each other. A large and very important portion of the book, taken chiefly from Rose, is then introduced and explained at length. The metals come first, then the acids and salt radicals. The method of valuing commercial samples of the alkaline carbonates, the assay of peroxide of manganese for the use of the maker of bleaching powder, the analysis of carbonates by a beautiful little process, of gunpowder, Regnault's estimation of the amount of carbon in iron and steel, &c., are here introduced. The section devoted to the complete analysis of mineral waters is rather scanty, considering the difficulties of the subject; but even this is perhaps judicious when we take into account the class of persons for whom the book is chiefly intended, and who certainly are not likely to occupy themselves with analytical investigations of such trouble and perplexity as the *satisfactory* examination of a mineral water invariably presents. Indeed all who have had experience in the matter will agree, that with the exception of the analysis of soils, there is hardly a more difficult problem in chemistry than the one referred to. To give the conflicting details of the different processes which have been adopted for this purpose would only tend to confuse the student and swell the size of the volume.

The analysis of organic bodies, with a few supplemental matters, concludes the book. Mr. Parnell has contented himself with briefly describing the processes in use in the Giessen laboratory, and of which the particulars were published by Professor Liebig about five years ago. A translation of this pamphlet has since been very well made by Mr. Griffin of Glasgow, in which the engravings in the original work have been very cleverly copied on wood and placed in the margins opposite to the text referring to them—an excellent practice, and one, by the way, which Mr. Parnell has adopted throughout. One cannot too much commend the liberal use of correct wood-cuts in this manner; they often convey to the eye at a glance a more accurate idea of the thing meant than pages of letterpress. The new process for determining nitrogen is also described.

We have here given a short description of the contents of this work, which there can be no doubt will be of essential service to the working chemist; but while its utility and excellence cannot be denied, there are many points which are open to stricture. The notice



of this work has however already occupied too much space to allow of any observations on these points being made at present: in the following Numbers a series of papers will be given, with a view to elucidate those parts of the above work which may appear to require correction.

## PATENTS.

*Patent granted to William Gossage, of Stoke Prior, Worcester, for certain improvements in the Manufacture of Sulphuric Acid.*

IN the new process for preparing sulphuric acid, the sulphurous acid is obtained by exposing iron pyrites to the combined action of heat and atmospheric air. The pyrites, which is a compound of one equivalent of iron with two of sulphur, becomes decomposed by this treatment, and the residue is a compound containing only one equivalent of sulphur. Mr. Gossage acts upon this sulphuret with muriatic acid, and thus obtains sulphuretted hydrogen, which is collected as gas, and a solution of muriate of iron, which can be used in many cases instead of the sulphate. The sulphuretted hydrogen is employed in the manufacture of sulphuric acid, being passed through a gas burner, and is thus burnt in contact with atmospheric air, by which means sulphurous acid is produced. This gas is conducted into the leaden chamber, and there becomes mixed with nitrous acid.

Mr. Gossage claims as his patent the use of the residual sulphuret of iron, and the employment of its sulphur in the manufacture of sulphuric acid; and also the preparation of muriate of iron from the said residual sulphuret.—Sealed May 8, 1838.

*Patent granted to Robert Warington, of London, for improvements in the Operation of Tanning.*

Mr. Warington claims:—

1. The use of the carbonates of soda or potassa, for soaking the hides or skins so as to enable the hair being readily removed.

2. The employment of baryta, potassa, soda, muriatic, nitric, oxalic, or any other acid except the sulphuric; as also vegetable matters, as culinary rhubarb, sorrel, &c., for the purpose of facilitating the removal of the hair, and at the same time swelling the hide or skin, or for swelling them only.

3. The use of the carbonates of ammonia as a grainer, for the purpose of graining hides or skins.

4. The employment of vegetable matters and chemical agents capable of retarding oxidation, such matters or agents to be used with the tanning agent employed.

5. The use of bichromate of potassa in solution or diluted sulphuric acid, for preserving skins or other animal substances.—Sealed March 16, 1841.



# THE CHEMICAL GAZETTE.

No. II.—Nov. 15, 1842.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

### *On the Conversion of Cinnamic Acid into Hippuric Acid by the Animal Œconomy.*

EARLY chemists who examined the urine of horses and cows, found in it an acid which they considered to be benzoic acid; but Liebig proved it to be a new substance, to which he gave the name of hippuric or urobenzoic acid. It is probable that the urine of graminivorous animals does not always contain hippuric acid, for Erdmann found sometimes benzoic, and at other times hippuric acid, in the urine of the same horse. It appears somewhat probable that excess of nourishment engenders the production of this acid, for it has been found that in the urine of well-fed horses hippuric acid was present, while in that of others employed in agricultural purposes only benzoic acid could be discovered; sometimes however the latter contained hippuric acid without any perceptible cause.

Wöhler attempted to derive the hippuric acid of graminivorous animals from the benzoic acid contained in some kinds of their food. On giving a dog some benzoic acid, he found crystals in its urine, which, according to the description, must have been hippuric acid; but this substance was not known at that time, and consequently Wöhler regarded it as benzoic acid. It has been stated that the urine of young children contained benzoic acid; this was probably hippuric acid. Lehmann, and also Ambrosiani, have found a considerable quantity of the latter acid in diabetic urine. Bouchardat found such a large quantity of it in some cases, that he founded on it a new disease which he calls "Hippurie." In these cases there was no benzoic acid taken into the system; and if hippuric acid was formed from it, the benzoic acid must have been first produced by the animal Œconomy, for the different kinds of food contain none of it. Ure found that benzoic acid by passing through the human system is converted into hippuric acid. Keller and Garrod have confirmed this statement. Garrod considers that the elements of lactate of urea (which has been found in the urine by Cap and Henry) unite with benzoic acid to form hippuric acid, and proves that Ure's statement of the uric acid effecting this change is quite incorrect.

An acid with which benzoic acid stands in very close relation, is  
*Chem. Gaz.* 1842.



the cinnamic, which was first obtained by Dumas by oxidizing oil of cinnamon; it has since been prepared in much larger quantities by Simon from *Storax liquida*. This acid appears to give a series of compounds precisely analogous to those of benzoic acid. By the action of dilute nitric acid it is decomposed into benzoic acid and oil of bitter almonds: it therefore seemed probable that this acid would also be converted by the human body into hippuric acid. This idea has been carried out by Erdmann and Marchand, and found to be perfectly correct. The dose of cinnamic acid taken at bed-time was from 80 to 90 grains.

Experiments were made to determine whether hippuric acid contains cinnamic or benzoic acids, but without any decisive result. An acid is obtained by distilling hippuric acid, which is benzoic acid; that it is not cinnamic acid may be proved by heating it with a little chromic acid; cinnamic acid evolves the smell of oil of bitter almonds. Hippuric acid itself, treated with this oxidizing agent, gave faint traces of the almond-oil.—*Journ. für Prakt. Chem.*, xxvi. p. 491.

*On Allantoin and Allanturic Acid. By M. PELOUZE.*

Allantoin was discovered by Vauquelin and Buniva in the waters of the amnios of the cow, and has since been obtained artificially by Liebig and Wöhler, when acting upon uric acid with the peroxide of lead. To these chemists we are likewise indebted for the knowledge of its true composition and its principal properties. The formula they have given for it is  $C^4 H^3 N^2 O^3$ .

It has been recently submitted to the following experiments by M. Pelouze:—When slightly heated with nitric acid of sp. gr. 1.2 to 1.4 it dissolves, and the liquid, on cooling, deposits a considerable quantity of nitrate of urea in beautiful crystals. Hydrochloric acid has the same action on it, hydrochlorate of urea being easily formed; under both circumstances no gas is liberated.

When the nitric solution of the allantoin, evaporated and dried at  $80^\circ$ , is treated with a little water and ammonia, a white viscid matter is precipitated by alcohol, which, redissolved in water and again precipitated with alcohol to free it entirely from nitrate of ammonia and urea (the only substances with which it is contaminated), constitutes a new nitrogenous acid, having for its formula  $C^{10} H^7 N^4 O^9$ .

It is uric acid plus 3 equivalents of water. It is white, slightly acid, deliquescent, but nearly insoluble in alcohol; on being subjected to distillation it affords a product strongly prussic, and a voluminous residue of charcoal. Acetate of lead and nitrate of silver give rise to white voluminous precipitates, which are soluble in an excess of the salts, and also in an excess of acid. The precipitate formed with ammoniacal nitrate of silver is far more considerable than that with the neutral nitrate. This new acid is generated under several other circumstances. It is always formed on decomposing uric acid and allantoin with the brown oxide of lead. Chlorine, nitric acid, and without doubt many other oxidizing bodies, equally



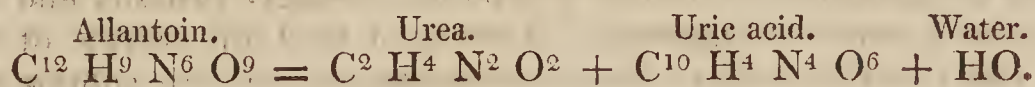
give rise to it when brought into contact with uric acid. When chlorine is passed in excess into a boiling solution of uric acid, nothing, it might be said, is found in the liquid but the quadroxolate of ammonia, which finally itself is decomposed into several gaseous products. In that masterpiece of chemical investigation on the products resulting from the oxidation of uric acid, Liebig and Wöhler have proposed a theory to combine and connect a series of facts which they had observed, according to which, urea is formed in definite proportion at the same time as allantoin and oxalic acid, by the decomposition of uric acid with the brown oxide. M. Pelouze has frequently observed the formation of the new acid in this reaction, and several times obtained only allantoin mixed with small quantities of urea; and as the brown oxide changes allantoin, even in the cold, into the new acid and urea, he is induced to think that this latter substance is the result of the decomposition of the allantoin, which is formed without urea in the first stage of the decomposition of the uric acid.

The new acid is called allanturic acid, as it derives its origin from allantoin, and has at the same time great analogy in its composition with uric acid; it is formed solely with urea, by the action of hydrated acids on allantoin; in fact, if we subtract from

3 equiv. allantoin =  $C^{12} H^9 N^6 O^9$   
 1 equivalent of urea =  $C^2 H^4 N^2 O^2$   
 -----  
 2 equivalents of water =  $C^{10} H^5 N^4 O^7$ , and add to the remainder  
 -----  
 we have  $C^{10} H^7 N^4 O^7$ , or 1 equivalent of the hydrated allanturic acid.

Water at a high temperature acts in a remarkable manner on allantoin, converting it into ammonia, carbonic and allanturic acids; no urea is formed during this change, as urea without the intervention of bases or of acids, with the presence of water only, is converted at a little above  $212^\circ$  Fahr. into carbonic acid and ammonia. These two decompositions were effected in closed tubes which were exposed for some instants in an oil-bath to a temperature of from  $279^\circ$  to  $347^\circ$  Fahr.

From the above, allantoin would appear to be a peculiar kind of salt in which the urea pre-existed already formed, and which would separate easily when enabled to furnish to the substance to which it was united the elements of a certain quantity of water. M. Liebig has observed that allantoin, as to its constitution, is the urate of urea with the equivalent of water common to these kinds of salts.



But the above reactions do not admit of its being classed among the urates.—*Ann. de Chim. et de Phys.*, Sept. 1842.



*Passage of Iron into the Urine.*

Gélis made experiments on twenty-four patients, of whom fifteen took daily 8·12 grains of lactate of iron, three daily 20 grs. of Vallet's pills, two 60 grs. of hydrated oxide of iron, four finely divided iron reduced by means of hydrogen, and two healthy females who took no iron. Gélis took from 6 to 700 grammes (9 to 10,000 grains) of urine, distilled it with an ounce of nitric acid, evaporated the residue, and heated it until all organic matters were burnt. The saline mass, dissolved in distilled water, gave no trace of iron to all reagents. Iron consequently does not pass into the urine; but it may easily be found in the excrement of patients who are taking preparations of iron.—*Journ. de Pharm.*, 1841.

*On Moschus artificialis and Oleum succini rectificatum.*

By M. ELSNER.

The artificial musk was prepared in the following manner:—1 part *Ol. succ. rectific.* was gradually conveyed, in small portions, into 3 parts of fuming nitric acid contained in a porcelain basin, great care being taken that no evolution of heat took place: otherwise it easily happens that, from the energy of the action, the oil inflames, and the already formed resin is burnt to a porous, loose shining coal. The resin obtained wasedulcorated with water until it contained not a trace of acid, and then evaporated in a water-bath to the consistency of a thick syrup. During the oxidation of the oil the odour of musk was quite distinct, and the resin, when perfectly washed with water, retained the same smell. Evaporated in the water-bath it possessed the following properties:—Colour deep reddish-brown, in thin threads, clear, transparent hyacinth red, easily soluble in alcohol, æther, and æthereal oils; the alcoholic solutions have an acid reaction, and on adding water to them, become opaque and milky; smell, in larger quantities, resembling that of *Colophonium succ.*; in small quantities, especially when dissolved, distinctly like musk; taste burning, bitter, aromatic. Rubbed in a mortar with potassa it evolves ammonia; heated on platinum foil it burns with a strong sooty flame, leaving behind a porous shining coal. The brown alcoholic solution of the resin was decolorized (straw-yellow) by passing a current of chlorine into it, also by sulphurous acid. On diluting it with water it still became milky, and the resin which separated possessed the smell of musk. Alcoholic solutions were mixed with alcoholic solutions of the following metallic salts:—with chloride of copper no perceptible change; with chloride of mercury and with nitrate of silver likewise no change; with acetate of lead a pulverulent yellowish-brown precipitate, which was entirely soluble in an excess of the acetate of lead, but insoluble in an excess of the solution of the resin. To prepare this combination in greater quantity a concentrated solution of the resin in alcohol was poured into an alcoholic solution of the acetate of lead until the precipitate appeared permanent; it was then brought on to a filter andedulcorated with alcohol. Dried at 176° Fahr. it had a light brown colour;



decomposed when heated above  $176^{\circ}$ , giving off red fumes, while the thermometer, in an experiment made on purpose, rose rapidly above  $356^{\circ}$  Fahr. This lead compound was suspended in water, and decomposed by passing a current of sulphuretted hydrogen through it, extracted with alcohol from the sulphuret of lead, which on evaporation left the resin behind without any trace of crystalline structure. The analysis of the lead compound afforded,—

	Found.	Equiva- lents.	Atomic weights.	Calcu- lated.
Carbon . . . . .	32.41	or 15	= 1125.00	= 32.34
Hydrogen . . . .	2.90	... 8	99.68	2.81
Nitrogen . . . .	4.43	... 1	177.04	5.09
Oxygen . . . . .	20.62	... 7	700.00	20.13
Oxide of lead..	39.64	... 1	1394.50	39.63
	<hr/> 100.00		<hr/> 3496.00	<hr/> 100.00

100 parts of the resin calculated from the lead compound consist, therefore, of—

Carbon . . . . .	53.67
Hydrogen . . . .	4.79
Nitrogen . . . .	7.33
Oxygen . . . . .	34.21

100.00, and the atomic weight = 2102.

To gain some insight into the change which had been effected by the action of the nitric acid on the *Oleum succ. rectific.*, this itself was next examined. For this purpose the oil was carefully rectified; it had then a pale yellow colour and the well-known peculiar smell, was free from sulphuric acid, of sp. gr. 0.8795 at  $61^{\circ}$  Fahr., and did not explode with iodine, but was only coloured brown by it; potassium and sodium remained, so the author states, with their metallic surfaces quite bright in it,—a fact which, if true, is very remarkable, the oil containing oxygen. It was soluble in æther and in alcohol; its composition was ascertained to be, in 100 parts,—

Carbon . . . . .	84.00
Hydrogen . . . . .	8.63
Oxygen . . . . .	7.40
	<hr/> 100.00

Compared with the composition of the resin contained in the lead compound, it is evident that, from the action of the nitric acid on the rectified oil of amber, a certain portion of carbon and hydrogen has been eliminated, and nitrogen and oxygen taken up, causing the formation of a nitrogenous electro-negative resin. Supposing the oil of amber to consist of several proximate constituents—a supposition which will be found hereafter to be fully confirmed,—the process is by no means so simple. When rectified oil of amber was heated over a lamp in a glass retort it boiled at  $266^{\circ}$  Fahr., and strongly at  $284^{\circ}$  Fahr.; a nearly colourless oil now passed over, the



boiling point still rose; at  $500^{\circ}$  Fahr. the residue in the retort became tenacious, thick, and assumed a brown colour, but yet a colourless oil continued to pass over; even above  $500^{\circ}$  the temperature continued to rise. Heating was now discontinued, and a brown thick fluid substance remained in the retort, which possessed the smell of *Colophonium succ.*, and behaved in the same manner towards solvents, such as æther, alcohol, æthereal oils, &c.

To examine the oil for other proximate constituents, it was mixed with from 16 to 20 times its volume of concentrated sulphuric acid in high cylindrical glasses, when, if the mixture is effected gradually, no evolution of heat or formation of carbonic or sulphurous acids is perceptible; a heavy, dark brown fluid subsides, frequently forming on the sides of the vessel beautiful violet-red stripes, and when the requisite quantity of sulphuric acid has been taken, a perfectly limpid oily substance, very distinct from the heavy brown fluid above which it settles, is deposited. This oil has no longer the penetrating smell of the amber oil, but is pleasant, and somewhat similar to that of ripe fruit, calling to mind eupione. It was separated, by means of a pipette, from the brown heavy fluid, and shaken with distilled water, when very soon two liquids separated, one light and limpid, the other beneath white, milky and opaque. They were separated from each other by means of a pipette; the white opaque liquid left behind on evaporation a whitish-gray substance, which melted at about  $104^{\circ}$  Fahr.; when more strongly heated burnt with a strong sooty flame, was insoluble in cold as well as in boiling alcohol, did not change on being warmed with caustic potash or with concentrated sulphuric acid, resembled therefore parafine, or some nearly allied pyrostearine.

The oily liquid, separated from the water by means of the pipette, was left in contact with fused chloride of calcium until it had become clear and limpid, upon which it was carefully distilled. The boiling point was not constant; it even exceeded  $536^{\circ}$  Fahr., at which temperature the distillation was discontinued; a brown resinous mass remained in the retort. The spec. grav. of the liquid was 0.645 at  $34^{\circ}$  Fahr.; that portion which had passed over last had a faint empyreumatic smell; that which had been received first, none. The oily liquid was limpid, dissolved iodine with a red colour without fulminating; remained unchanged when brought into contact with potassium, even when warmed; made fat spots on paper, which however disappeared on being exposed to heat; was soluble in alcohol of  $0.810^{\circ}$ , and in sulphuric æther, æthereal and fat oils; mixed with water, it soon separated; mixed with 3 parts of fuming nitric acid, it acquired a dark brownish red, subsequently a clear reddish brown colour; on adding water to this fluid it became milky and opaque, and deposited, after some hours, a yellowish resin, which possessed all the properties of the above-described artificial musk; its alcoholic solution has a powerful smell, like the very best musk. The precipitate with lead had all the properties of the compound previously described; it is evident therefore that the formation of the artificial musk is due to this oily substance. As the oily liquid so much resembles eupione, M. Elsner calls it *Succin-eupione*, and



the so-called *Moschus artificialis*, *Succin-eupione resin*. Succin-eupione consists of—

	Found.	Atoms.	Calculated.
Carbon .....	84.548	32	84.58
Hydrogen .....	11.983	27	11.89
Oxygen .....	3.469	1	3.53
	100.000		100.00

Supposing the oil to consist of the carburetted hydrogen common to most of the æthereal oils containing no oxygen and water, the following formula might be calculated :—

	Atoms.	In 100 parts.
Carbon .....	35	= 85.02
Hydrogen .....	29	= 11.74
Oxygen .....	1	= 3.24

and the rational formula would be  $7 (C^5 H^4) + H O$ .—*Journ. für Prakt. Chem.*, xxvi. p. 97.

#### *Calculi from Intestines of Horses.*

Calculi from the intestines of horses have been examined by Kablik, and found to consist solely of magnesio-phosphate of ammonia and animal matter, without a trace of lime salts.—*Pharm. Cent. Bl.*, 669.

#### *Carbonate of Potassa an Antidote for Arsenic.*

Dr. Emsmann was called to a patient who had been poisoned by white arsenic; she was in great pain, was vomiting, purging, and suffering great thirst. He gave, every half hour, a spoonful of a mixture compound of half an ounce of the *liq. kali carb.* in two ounces of *syr. althææ*. The effect was immediate; the vomiting ceased, the pain was relieved, and the other symptoms gradually disappeared.—Hufeland's *Journal*.

The antidote for arsenic proposed some years since by Professor Bunsen of Marburg does not seem to have come into such general use as it deserves. As is well known, it consists in giving repeated doses of the hydrated sesquioxide of iron mixed up in milk, or any other convenient liquid. That it may not succeed in all cases is very probable, but its success has been so great and striking, that its use cannot be sufficiently recommended to all medical men. We would also call the attention of the druggists to the point, that they might always keep a supply of the hydrate. It is best prepared by digesting iron wire (which is quite pure enough for the purpose) in hydrochloric acid which has been examined as to its freedom from arsenic; the solution contains the protochloride of iron, which must be converted into the perchloride by passing into it a current of chlorine, until the solution acquires a pure yellow colour. Ammonia is then added, the precipitated hydrate well washed, and preserved in a stoppered bottle filled up with water, so that it is kept in a moist



state, and may be always ready for use. We earnestly recommend this to the notice of all chemists and druggists, as well as to country practitioners.

#### *Uric Acid in the Urine of Horned Cattle.*

Bruecke has discovered the presence of this acid in the urine of the ox, which has as yet been denied. It is not a pathological product, for he found it in several healthy animals. Whether it is present in the urine of other graminivorous animals remains to be proved. Mr. Fownes has also noticed the presence of uric acid in the urine of cows.—Müller's *Archiv für Anatomie*, 1842, p. 91; *Phil. Mag. for November*, p. 382.

#### *The renowned Vomitif-purgatif of Leroy.*

This is one of the numerous secret medicines offered for sale in France. It consists of two bottles, one labelled *vomitif*, the other *purgatif*. The first contains a solution of tartar emetic in white wine, coloured with sugar-candy, of the strength of from 4 to 5 grains *tart. emet.* in a table-spoonful; the second bottle contains a tincture of jalap, 25 to 30 grains *resina Jal.* dissolved in a table-spoonful. It may easily be imagined how much evil is produced by such means.—*Ann. der Arzneik.* 1841, p. 734.

#### *Médecine Noire.*

Also one of the French nostrums, enjoying great celebrity. It contains nothing else than tamarinds, *follicul. senn.*, salts of Glauber, and manna.—*Ibid.*

## ANALYTICAL CHEMISTRY.

### *On the Use of Cyanide of Potassium in Chemical Analysis.*

SOME time since Liebig published a new method of preparing cyanide of potassium from the ferrocyanide, by which a considerably larger quantity was obtained than by the previously known processes. The preparation contained a portion of cyanate of potassa, which however affects its use but in a very slight degree. Professor Liebig has in that paper (of which a translation has appeared in the 'London, Edinburgh and Dublin Philosophical Magazine' for April) pointed out the great services we are likely to derive from the use of this preparation as a reducing agent in the dry way, and also as a means of separating certain metals from each other when in solution. MM. Haidlen and Fresenius have carried out Liebig's idea still further, and have examined the behaviour of this cyanide of potassium towards various oxides and sulphurets, its use as a flux, and how it may be employed for separating various bodies. This substance, which can now be so easily prepared, promises to be of essential service in analytical researches. Under the name of



“cyanide of potassium,” is understood the salt as prepared by Liebig containing a little cyanate. It may be as well to describe the process in this place. Eight parts of ferrocyanide of potassium, perfectly free from water, are mixed with three parts of carbonate of potassa. The latter must be perfectly dry and pure, especially free from sulphuric acid. It is best to fuse the mixture in a well-covered iron crucible, inasmuch as the Hessian crucibles are easily destroyed and silica taken up. A gentle red heat must be maintained throughout, in which case the reduction of the iron succeeds fully. The mass obtained must be free from iron, silicic acid and sulphuret of potassium. The solution usually employed was 1 part of the mixture in from 6 to 8 of water.

*Behaviour of the Reagent to Oxides and Sulphurets.*

All the salts employed were naturally in a state of solution. It was found that the difference of the acid caused no alteration in the action, and no perceptible change was observed when the acid was in excess or not.

1. Potassa, soda and ammonia are not changed at all.

2. Lime, baryta, strontia.—When the cyanide is added to a solution of these earths, they are fully precipitated as carbonates, resulting from the decomposition of the cyanic acid. The precipitates are perfectly insoluble in excess of cyanide of potassium. If not sufficient has been added, part remains dissolved as metallic cyanide, which is however converted into carbonate by standing, and more rapidly by the application of heat.

3. Magnesia behaves exactly like the foregoing earths, only that by the decomposition of the cyanate of potassa a salt of ammonia is formed, which must be first destroyed by boiling with carbonate of potassa, when full precipitation occurs.

4. Alumina is fully precipitated; the hydrated earth is insoluble in excess of cyanide in the cold; a small quantity is dissolved by heat, which may be precipitated by means of sal-ammoniac.

5. Manganese.—On the addition of a small quantity of a proto-salt of this metal to the cyanide, a brownish red colour is produced; and if more manganese be added, a dirty reddish yellow voluminous precipitate of protocyanide of manganese is thrown down, which dissolves in a large quantity of cyanide of potassium. The salt held in solution is mangano-cyanide of potassium. Acids do not separate the simple cyanide. Sulphuret of manganese is soluble in excess of cyanide; the solution contains mangano-cyanide and sulphuret of potassium.

6. Iron.—Cyanide of potassium gives a yellowish red precipitate with protosalts, which dissolves in a large excess, more easily when caustic potassa is added. Ferrocyanide of potassium is formed. Sesquioxide salts give a reddish brown precipitate, which is only partially soluble in excess of the precipitant. The same salt is formed. Sulphuret of iron dissolves when heated with the cyanide, particularly on the addition of potassa. The solution contains ferrocyanide and sulphuret.



7. Cobalt gives a yellow flocculent precipitate soluble in excess. If the solution be heated, and free hydrocyanic acid be present, cobaltosesquicyanide is formed, which is not decomposed by acids. The sulphuret can also be dissolved.

8. Nickel gives a flocculent light green precipitate of cyanide, easily soluble in excess of precipitant. The yellow solution contains a double cyanide. Acids reproduce the precipitate by decomposing the cyanide of potassium; but this precipitation is never perfect, inasmuch as a portion of nickel remains dissolved whether the process be conducted with or without the application of heat. Acetic acid does not decompose the double cyanide. Newly precipitated sulphuret of nickel dissolves easily in cyanide of potassium when heat is employed. On the addition of acetic acid to the colourless solution, hydrocyanic acid and sulphuretted hydrogen are evolved, without any precipitate being produced; a mineral acid however causes a deposition of cyanide of nickel.

9. Zinc.—Salts of this metal give with cyanide of potassium a white gelatinous precipitate of cyanide of zinc, which forms a soluble double salt with excess; acids reprecipitate the cyanide of zinc (acetic acid not excepted). Carbonate of zinc also dissolves in cyanide of potassium. Sulphuret of zinc, when warmed with the cyanide, gives a clear solution, which contains sulphuret of potassium and the double cyanide. Acetic acid precipitates a part of the cyanide of zinc, with evolution of sulphuretted hydrogen and hydrocyanic acid.

10. Cadmium.—The salts of this metal behave exactly like those of zinc, except that the sulphuret is insoluble in the cyanide of potassium, and consequently the whole of the cadmium is precipitated out of a solution of the double cyanide by sulphuretted hydrogen.

11. Lead.—Cyanide of potassium completely precipitates lead out of its solution in the form of carbonate, which is however mixed with a small quantity of the precipitant; for when dissolved in nitric acid, and the lead precipitated with sulphuretted hydrogen, the filtered solution is found to contain a small quantity of a potassa salt. The precipitate of carbonate is quite insoluble in excess of cyanide, as is also the sulphuret of lead.

12. Oxide and sulphuret of bismuth behave precisely like the analogous lead compounds.

13. Uranium.—If a small quantity of a solution of peroxide of uranium be added to a solution of the cyanide, a yellow solution is obtained. More uranium produces a precipitate of cyanide of that metal, which is soluble in a large excess of the cyanide of potassium with the aid of heat. Acids produce no precipitate in this solution\*.

14. Copper.—Cyanide of potassium produces, in salts of the oxide of copper, a yellowish green precipitate, which dissolves easily in excess of the precipitant. Acids precipitate from this solution white

\* It is probable that uranium gives double cyanides, similar to those of iron and cobalt. The authors are at present engaged in their examination.



dicyanide of copper, which is soluble in excess of acid. Sulphuret of copper is easily dissolved by the cyanide. The yellow solution contains sulphuret and cupro-cyanide of potassium. On the addition of excess of sulphuric or hydrochloric acid the whole of the double cyanide is decomposed, and the entire quantity of copper precipitated in the form of sulphuret, while all the hydrocyanic acid is evolved.

15. Mercury.—Salts of the dinoxide give a gray precipitate, which is a mixture of metallic mercury with its cyanide. The oxide, whether alone or in combination, always forms cyanide, soluble in an excess of cyanide of potassium. The cyanide of mercury is not decomposed by boiling with dilute oxy-acids. Both sulphurets are insoluble in the alkaline cyanide. Sulphuretted hydrogen decomposes the double cyanide entirely.

16. Silver.—Salts of this metal give a white caseous precipitate of cyanide of silver, which is easily soluble in excess of the precipitant. Nitric acid reprecipitates the whole of the cyanide, which is not soluble in excess of acid. Chloride of silver is easily soluble in cyanide of potassium, but the sulphuret is not.

17. Gold.—Solutions of the perchloride give a yellow crystalline precipitate of protocyanide of gold, easily soluble in excess of alkaline cyanide. Hydrochloric acid decomposes the cyanide of potassium and reproduces the precipitate.

18. Platinum.—Bichloride of platinum gives a crystalline yellow precipitate of bicyanide, which is easily soluble in excess of cyanide of potassium when heat is applied. Acids reprecipitate the cyanide of platinum; hydrochloric and nitric acids dissolve it. Ammonia, added to the hydrochloric solution, precipitates the well-known double chloride of platinum and ammonium.

19. Tin.—The chlorides, when mixed with the cyanide of potassium, give precipitates of protoxide and peroxide of tin. The liquid always contains a little tin. Protosulphuret of tin, treated with a great excess of a boiling solution of cyanide of potassium, is partly dissolved; the solution, if filtered and treated with acid, gives a precipitate of bisulphuret. When the bisulphuret is boiled with the alkaline cyanide, a part of it is dissolved, while hydrated binoxide of tin remains undissolved.

20. Antimony.—The protochloride behaves like the analogous salt of tin. The protosulphuret is dissolved by long boiling. Sulphuret is taken up very easily, and is reprecipitated by acids.

21. Chromium.—Salts of this metal give a green precipitate, which, when digested with a large quantity of alkaline cyanide, forms a yellow solution, in which acids produce no deposit. It contains chromo-cyanide of potassium, as Böckmann has already shown.

The action of cyanide of potassium on some metallic acids was also examined. The reactions on arsenious, tellurous, titanous, wolframic, and molybdic acids, were precisely similar to those produced by pure caustic potassa.

If we attentively examine the behaviour of the different metals, we shall find that they may be divided into two principal classes:—



*A.* "Metals whose salts do not give any compound with cyanogen when mixed with cyanide of potassium."

These may be again subdivided into,—

*a.* Such as are not at all precipitated by the alkaline cyanide,—potassa, soda, ammonia.

*b.* Such as are only partly precipitated,—tin and antimony.

*c.* Such as are fully precipitated,—lime, baryta, strontia (magnesia), alumina, lead, and bismuth.

*B.* Metals which, when mixed in solution with cyanide of potassium, are themselves converted into cyanides.

These may be subdivided into three groups:—

*a.* Those whose cyanides are insoluble in water, but are dissolved by the alkaline cyanide in such a manner that soluble binary compounds of the second order are formed. ( $M\text{ Cy} + K\text{ Cy}$ .)

Acids decompose the cyanide of potassium in this compound, and precipitate the metallic cyanide. This is either insoluble in nitric acid,—cyanide of silver; difficultly soluble,—cyanide of nickel; or easily soluble, as the dicyanide of copper, the cyanides of zinc, cadmium and platinum, and the protocyanide of palladium.

*b.* Those whose cyanides are insoluble in water, but soluble in great excess of alkaline cyanide. Compounds are formed in which the whole of the cyanogen is united to the heavier metal, forming a compound radical, which then combines with potassium ( $M\text{ Cy}^3 + 2\text{ R.}$ ). Acids do not precipitate the metallic cyanides out of these solutions,—iron, cobalt, manganese, chromium, and uranium.

*c.* Mercury, the cyanide of which is soluble in water.

It is evident from the above that the cyanide of potassium affords an excellent means of separating different groups of metals from each other, and of dividing and subdividing these groups. A few of the most important cases, and where its use appears preferable to the methods generally employed, will be next pointed out.

[To be continued.]

### *On the Use of Hyposulphites in Analysis.*

The use of sulphuretted hydrogen in chemical analysis is absolutely necessary, but in many cases it is connected with certain disadvantages which render its employment very disagreeable. Its odour is extremely offensive, and it requires time to saturate any solution with the gas. To obviate these inconveniences, M. Himly has proposed using hyposulphite of soda or potassa. The acid in this salt may be considered as consisting of sulphurous acid and sulphur. The sulphurous acid will exert a reducing agency on any oxide, while the sulphur will combine with the metal thus set free. It is necessary for this purpose to decompose the hyposulphurous acid by some stronger acid. M. Himly has found this salt of great use in several cases, and has described some of them; but as he intends shortly publishing a full account of his experiments, it may perhaps be better to refrain from entering more at large on the subject at present.



## PHARMACOLOGY.

*On the Barks of Commerce.*

[Continued from page 17.]

III. CINCHONA DE CUSCO ; *Cusco Cinchona* ; *China Cusco*, Germ.

THIS bark M. Winckler considers to be identical with the Arica bark of Pelletier, with original specimens of which he had an opportunity of comparing it. It occurs generally in moderately thick short quills, or in nearly flat pieces with or without epidermis. When the outer layers are uninjured, the surface is either quite smooth, in some places shining, or it is covered with small irregular shallow impressions, and sometimes irregular warty protuberances are met with. Specimens rarely occur with the surface furnished with a number of longitudinal grooves, imparting to them a more regular appearance. The colour of the surface in those barks with well-preserved epidermis, is silvery white passing into gray ; in injured specimens, or where the epidermis has been partially abraded, irregular brown, or almost black spots, of various sizes, occur, which give to the barks a chequered appearance ; and in many, especially in the thicker flat pieces, the dark spots are frequently of considerable extent, in which case the surface appears of a dark grayish brown, or nearly black colour. In those specimens without epidermis, and which occur most frequently in quills, the surface is nearly smooth, or has a few slight impressions resembling *Canella alba*, and on these sometimes occur large shallow scars. The colour of the uncovered surface resembles that of the naked *Cinchona rubiginosa*, only somewhat darker. Many quills are found among *Cinchona carthagena dura*, which resemble to deception the Cusco bark ; the surface therefore presents nothing characteristic. Cusco bark may be easily broken crossways, even the thick pieces ; the fracture then appears splintery, and in many, especially the thinner pieces, almost crooked, resembling in this respect *Canella alba*. It has a remarkably bitter taste, which is of considerable duration ; but the best character is the easy divisibility of the substance when chewed. The great similarity of this bark to some specimens of *Cinchona carthagena dura*, renders it almost impossible to distinguish it by its external characters ; and of the many samples considered to be Cusco, only one afforded an alkali which agreed with the aricine described by Pelletier ; several specimens, which had the greatest resemblance to Cusco bark, afforded less alkali, and cinchonine besides aricine.

In order to distinguish between the two kinds, the one which contained neither quinine nor cinchonine, but a peculiar alkali, and which is therefore regarded as identical with Pelletier's Cusco bark, is denoted by A ; the other, containing both cinchonine and the new alkali, by B. 500 grains of the powder were extracted with alcohol, the tannin separated by hydrate of lime, and the further examination conducted in the same manner as described under Huamalies bark. The following are the results :—



A.  
In 500 grains.  
7 gr. new alkali.  
8.75 gr. kinova bitter.  
1.25 gr. fat.

B.  
In 500 grains.  
2 gr. new alkali with cinchonine.  
10 gr. kinova bitter.  
2.5 gr. fat.  
1.25 chlorophylle.

The alkali contained in A. separated very easily, on slowly evaporating the alcoholic solution, in circular parties of crystals consisting of minute prisms, and was easily obtained pure on redissolving in alcohol and recrystallization. The crystals are then colourless, and have a vitreous lustre. It could not be separated into cinchonine and quinine by treatment with æther, and differs

*From Cinchonine,*

1. In being far more soluble in alcohol and in æther.
2. Not sublimable.
3. The aqueous solution of the bisulphate having a blue opake-ness.
4. The taste of the crystallised compound far more bitter.
5. The neutral sulphate less soluble in water.

*From Quinine,*

1. Far less soluble in alcohol and æther.
2. Easily crystallising.
3. The neutral sulphate easily soluble in water, and the crystals differing from the corresponding salt of quinine by their dark appearance.
4. The precipitate caused by ammonia or potash not being resinous, but in the form of a powder.

*Reaction of cold and hot infusions of the Cusco Barks A. and B, and of that obtained from Pelletier.*

A.

*Cold infusion.*

Nearly colourless, slightly yellow, taste not very bitter, astringent.

*Decoct.*

The warm liquid light brownish yellow, transparent; smell, weakly of bark; on cooling, slightly turbid, deposit inconsiderable; taste, strongly bitter, but not of long duration.

B.

Lighter colour than A, and less bitter.

Not very different from A, of somewhat darker colour, with a reddish tint.

*Bark from Pelletier.*

Colour scarcely yellowish, frothing when shaken; taste, strong and disagreeably bitter, slightly astringent, not of long duration; smell, weakly of tan.

While hot brownish yellow; cold, opalescent, deposit considerable, coagulated, flocculent.



*Experiments with the cold Infusions.*

IMMEDIATELY AFTER PREPARATION.						
	<i>Gelatine.</i>	<i>Tincture of Galls.</i>	<i>Perchloride of Iron.</i>	<i>Emetic Tartar.</i>	<i>Oxalate of Ammonia.</i>	<i>Iodic Acid.</i>
Cusco Bark A.	As in B.	As in B.	Colour and turbidness slighter than in B.	Turbidness thrice more considerable than in B.	As in B.	At first as in B, but very soon becoming turbid; colour deeper than in B.
Cusco Bark B.	Inconsiderable yellowish white turbidness.	Slight white turbidness.	Dark green colour, changing into blue-green after a few minutes' turbidness.	Slight white turbidness.	Slight white turbidness.	After some time yellowish brown and turbidness.
Pelletier's Bark.	Inconsiderable white turbidness.	Slight yellowish white turbidness.	As in B, but turbidness stronger.	Slight yellowish white turbidness.	Scarcely perceptible white turbidness.	Change of colour into yellowish brown, with turbidness.
AFTER TWENTY-FOUR HOURS.						
Cusco Bark A.	Precipitate larger than in B.	Precipitate yellowish white, otherwise as in B.	Precip. larger than in B, colour greenish brown.	Precip. 4 times larger than in B, liq. clear and colourless.	As in B, precipitate somewhat larger.	Precipitate far more considerable than in B.
Cusco Bark B.	A slimy opalescent precip., slighter than in the decoct, and of lighter colour.	Large dirty white flocculent precip., liquid transparent, colourless.	Slight dark brown precip., liq. deep yellowish brown, greenish.	Slight dirty yellowish white precip., liq. clear, yellowish.	Very slight white powder, liq. clear, colourless.	Large yellowish brown precip., liq. clear, colourless, with smell of iodine.
Pelletier's Bark.	Slight white flocculent precipitate, liq. colourless, scarcely opaque.	Inconsiderable but voluminous flocculent precip. of yellowish white colour, liq. clear, colourless.	Slight dark brown powder, liq. intense light greenish brown, clear.	Large yellowish white flocculent precipitate, liq. clear, colourless.	Very slight white precip., the under layer pulverulent, adhering firmly to the glass, liq. clear, slightly yellow.	Large brownish yellow flocculent precip., liq. clear, yellowish.



*Experiments with the Decocts of the Cusco Barks.*

IMMEDIATELY AFTER PREPARATION.						
	<i>Gelatine.</i>	<i>Tincture of Galls.</i>	<i>Perchloride of Iron.</i>	<i>Emetic Tartar.</i>	<i>Oxalate of Ammonia.</i>	<i>Iodic Acid.</i>
Cusco Bark A.	Turbidness stronger than in B, subsequently a flocculent white precipitate.	Turbidness slighter than in B.	As in B.	Turbidness stronger than in B.	As in B.	Turbidness stronger than in B.
Cusco Bark B.	Considerable yellowish white turbidness.	Considerable yellowish white turbidness.	Dark grass green turbidness, soon increasing and changing into brown.	Considerable yellowish white turbidness.	Slight whitish turbidness.	At first clear; soon a yellowish brown turbidness.
Pelletier's Bark.	Considerable yellowish white turbidness.	Considerable yellowish white turbidness.	Beautiful grass green colouring, changing into brown; at first no turbidness.	Considerable yellowish white turbidness, and soon a flocculent sediment.	Slight white turbidness, upon which a pulverulent precip. forms.	No change at first; subsequently a reddish brown colouring and turbidness.
AFTER TWENTY-FOUR HOURS.						
Cusco Bark A.	Precipitate of lighter colour, and less considerable than in B.	Precip. larger and lighter colour than in B.	As in B, the colour of the precipitate more green.	Precipitate larger and lighter than in B.	As in B.	Precip. larger than in B.
Cusco Bark B.	Considerable dirty orange-coloured magma, liquid clear and colourless.	Large pale brownish yellow flocculent precip., liq. clear light wine-yellow.	Large dark greenish brown flocculent precip., liq. clear light brownish green.	Large pale brownish yellow flocculent precipitate, liq. clear, colourless.	Slight and pulverulent white precip., liq. almost colourless.	Large yellowish brown flocculent precip., liq. pale yellow, with smell of iodine.
Pelletier's Bark.	Large yellowish white precip., liquid clear, slightly yellow.	Large yellowish white flocculent precipitate, liq. perfectly clear and colourless.	Large grayish brown flocculent precipitate, liq. clear but dark greenish brown.	Large yellowish white flocculent precip., liq. clear and colourless.	Slight yellowish white flocculent precip., liq. opaque pale yellow.	Large pulverulent dark brownish yellow precip., liq. clear, slightly yellow.

[To be concluded in our next.]



*Quinovine.*

The bark of the Peruvian plant *Cinchona*, or *Quina ovata*, and which is known by the name of the *white Quina* of Condamine, has been rejected as a medicinal agent on account of its not possessing antifebrile properties like the other barks. M. Manzini has found, indeed, that it contains neither quinine nor cinchonine, but a new vegetable alkali which he has named Cinchovine or Quinovine: it may be prepared in exactly the same manner as quinine. It crystallizes in long prisms, of a bitter taste, which is only evident after a considerable lapse of time, on account of the difficult solubility of this base; it is quite inodorous. It is easily soluble in alcohol, particularly when warmed; it is less soluble in æther, and almost insoluble in water. Dilute acids dissolve quinovine and form salts, which crystallize very easily, are soluble even in weak alcohol, and which are decomposed by caustic and carbonated alkalies which separate the base. Moreover, they are precipitated by solutions of iodide of potassium, chlorides of platinum and gold, and by other metallic chlorides. Ammonia does not precipitate the whole of the quinovine; a part is dissolved and crystallizes out on evaporation. The precipitate also becomes crystalline by standing. The alcoholic solution of quinovine is very bitter, and has an alkaline reaction. This base is not altered by exposure to a temperature of 300° Fahr. It is decomposed at 374° Fahr. At 370° it melts to a brown liquid, which solidifies on cooling, forming a resinous mass; this melts at the same point as the crystallized base, viz. 370°. The formula for the crystallized body, which is anhydrous, is  $C^{46} H^{27} N^2 O^8$ . By dissolving quinovine in a slight excess of sulphuric acid, and evaporating, a bisulphate is obtained, the formula of which is  $C^{46} H^{27} N^2 O^8, 2 S O^3 + 2 HO$ .—*Compt. Rend.* xv. p. 105.

## CHEMICAL PREPARATIONS.

*Preparation of Æthers.*

THE production of the combinations of æther with *inorganic* acids has not been found to be attended with any difficulty. We can obtain hyponitric æther, the sulphuric and nitric methylic æthers, &c. by the direct action of the inorganic acids on the hydrated æthereal bases. Such is not however the case with the inorganic acids. A number of contrivances have been called into play to induce these bodies to combine with the æthereal base; the organic acid was either made to come in contact with the alcohol or wood-spirit in a nascent state, being set free from one of its combinations by means of a strong inorganic acid, or else the organic acid being mixed with the alcohol, a quantity of sulphuric or hydrochloric acid was added. It was afterwards found that, by distilling some organic acids with alcohol, the æthers could be obtained, but frequently the combination proceeded very slowly, and it was found necessary again and



again to return the products of distillation back into the retort in which the process was conducted.

Gaultier de Claubry has found (*Compt. Rend.* xiv.) that if the organic acids be heated nearly to their point of decomposition, and the alcohol dropped gradually on them, the æthers are formed very readily. Some acids, which are wholly or partly volatile, gave in this manner very large quantities of æther, *e. g.* oxalic, benzoic, and succinic acids. It does not appear so good with those acids which easily undergo metamorphoses at a rather low temperature, as, for instance, citric acid, for in that case the compound obtained may be either citric, itaconic, citraconic, or aconitic. The experiments with fatty acids did not succeed so well, nor did those with wood-spirit.

The method of M. de Claubry may possibly be very advantageous in some instances, but it is a matter of doubt whether the old methods, with some slight modifications, will not be found preferable in most cases. A method which has lately come considerably into practice, and which is particularly applicable to the fatty acids, is to dissolve the organic acid in alcohol or wood-spirit, and to pass a current of hydrochloric acid gas through the solution. Another method, which we can recommend from extensive personal experience, is to mix equal quantities of the alcohol and organic acid together, and to add to this a small quantity (a quarter or an eighth) of sulphuric acid. The mixture is poured into a flask, into which a cork is fitted, through which passes an upright thin tube about five feet long. The flask is heated either by a sand-bath or a spirit-lamp, and the mixture allowed to boil gently for several hours. The length of tube causes all the spirituous vapours to be condensed and to flow back, so that no loss of substance occurs. For many æthers this method is infinitely preferable to those generally in use. To mention only one more particularly, we might adduce the preparation of mucic æther. By Malagutti's method it is obtained quite black, and can only be obtained pure by often-repeated crystallizations. By the above-described method it requires only one crystallization, and is obtained of a most beautiful white colour.—EDITORS.

#### *Preparation of the Lactate of Iron.*

According to Pagenstecher, the lactate of lime, which is easily obtained from sour milk, and lactate of ammonia, may be employed to advantage in preparing the salt of iron. Common carbonate of ammonia of commerce is added to the solution of the lactate of lime, the carbonate of lime removed by filtration, the liquid concentrated by evaporation at a gentle heat to the consistency of a syrup. This concentrated solution of the lactate of ammonia is mixed with six times its weight of alcohol of sp. gr. 0.879, and a concentrated aqueous solution of protochloride of iron now added, the quantity of which is best determined from the lactate of lime used for the ammonia salt; for 100 parts of the lime salt,  $\text{CaO}, \bar{\text{L}} + 36 \text{ aq}$ , 38 parts protochloride of iron containing 16.48 iron. Soon after mixing the liquids the solution becomes turbid from the separation of the lactate



of iron, which continues forming, and is completed within 24 to 36 hours. The mixture then presents the appearance of a white syrupy mass, resulting from the separated crystals of lactate of iron; it is freed from the liquid portion by straining and pressure,edulcorated with alcohol, strained and pressed again, and then dried, spread out in thin layers between folds of bibulous paper at a gentle heat. The preparation thus formed is a light crystalline powder of a whitish yellow colour and agreeable ferrous taste. To obtain it perfectly white it should be dried *in vacuo* over sulphuric acid.

It may also be formed direct from the lactate of lime without first converting this into the ammonia salt; but the less solubility of that salt in alcohol, and the difficulty of freeing the preparation from adhering chloride of lime, renders the employment of the lactate of ammonia preferable. A slight residue of perchloride of iron, arising from an oxidation of the protosalt, is moreover of no consequence in preparing according to the above method, as the lactate of the peroxide of iron is insoluble in alcohol.—Buch. *Rept.*, xxvi. p. 307.

#### *Preparation of pure Oxide and Sulphate of Zinc.*

The common sulphate of zinc of commerce frequently contains copper, cadmium, lead, iron, and manganese. By digesting its concentrated solution for some time with metallic zinc, it may be freed from copper, lead, and cadmium, for these metals are all reduced and precipitated in a metallic state; or the acid solution may be treated with sulphuretted hydrogen as long as any precipitate forms. In order to separate the iron, chlorine gas is passed into the solution, by which the iron is converted into the protochloride; if this solution be exposed to the air for a length of time, it absorbs oxygen, and oxide of iron (basic salt?) is deposited as a yellow powder, from which the solution must be filtered. If the sulphate contain manganese, which is not very often the case, the solution must be boiled up a few times with purified charcoal, filtered and evaporated; or the solution may be digested with hypochlorite of soda, an excess being avoided, which would occasion a considerable loss of oxide of zinc. Professor Artus proposes the following as an easier and more perfect method of separating the iron, after the copper, lead and cadmium have been removed. The solution being filtered from these metals, is evaporated to crystallization; the crystals being dried, are finely powdered, carefully mixed with 2 per cent. of finely divided saltpetre, and placed in a crucible surrounded with coals, and gently heated, the whole being constantly stirred with a spatula of glass or porcelain, until the mass is nearly dry, after which it is heated for some minutes. All the iron is by this process converted into sesquioxide, and colours the mass yellow or yellowish brown. The sulphate of zinc is now extracted with water, and if it contain manganese, it is boiled up with charcoal, filtered, and evaporated. The oxide is obtained by precipitating the solution with carbonate of soda, washing the precipitate, and heating it to drive off the carbonic acid.—*Journ. für Prakt. Chem.*, xxv. p. 508.



*Syrupus Olei Jecoris, according to Duflos.*

This consists of 250 grs. *olei jecoris*, 156 grs. *pulv. gum. arab.*, 375 grs. *aq. comm.*, 125 grs. sugar syrup, and 750 grs. lump sugar. The dose is from half an ounce to one ounce in an aromatic decoct, to which wine is added.

*Tinct. Rhei vinosa.*

According to Fleischmann, this syrup, when it has become opaque and yellowish, again acquires its clear brown colour when left for some time in a moderately warm place.—*Buch. Rept.* xxiv. p. 127.

*On Basic Iodide of Zinc.*

An extremely advantageous method for preparing iodide of potassium has been lately proposed; it is by forming iodide of zinc by digesting iodine and zinc filings with water, and then decomposing this salt by carbonate of potassa. Müller has observed that if the hot solution of the iodide of zinc be filtered off from the excess of zinc, or if the filter be washed out with hot water, it deposits a white substance on standing, which is a basic iodide of zinc; it is formed in very small quantities; on preparing 5528 parts of iodide of zinc, only 12 parts of this compound were obtained. On precipitating the iodide of zinc by means of carbonate of potassa, the carbonate of zinc always contains this basic salt, if the solution was filtered from the undissolved zinc while hot. If, however, the mixture be allowed to stand for some hours, and then filtered and precipitated, the carbonate of zinc contains no iodine.

It is well known that officinal iodide of potassium often contains some iodate of potassa, and it is important to ascertain this. Müller has made some experiments to determine what degree of delicacy the Simon's test for the presence of iodate in the iodide possesses. He found iodide of potassium, containing only  $\frac{1}{60000}$  of iodate, even when diluted 15,000 times, gives a perceptible yellow tinge, which becomes gradually darker on the addition of a very dilute acid, as for instance the acetic.—*Journ. für Prakt. Chem.* xxvi.

*Preservation of Lunar Caustic.*

Duméril covers the sticks of caustic with a layer of sealing-wax, containing a large proportion of shell-lac, which adheres strongly to it. These sticks may then be used just like pencils; the end to be used only requires to be uncovered with a penknife.—*Journ. de Pharm.*, xlii. p. 320.

*Verbena officinalis.*

The decoct of this plant is strongly recommended by Boshanov as a powerful anti-febrile.—*Buch. Rept.*, xxv. p. 91.



## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*On the Manufacture of White Lead.*

THE great value of this substance as a colour, and its extensive use as an article of manufacture, has caused it to engage the attention of a great number of persons; and the consequence has been that numerous patents have been taken out for improvements in its preparation. More experiments have been made on this salt than perhaps on any other chemical compound; and as in the last year a considerable number of papers have been published on the subject, and the theory of its formation has received considerable elucidation, it might not be altogether unacceptable to our readers to furnish them with an abstract of the whole.

The simplest method, in a chemical point of view, is that of Thénard, which consists in passing a current of carbonic acid gas through a solution of basic acetate of lead; carbonate is precipitated and neutral acetate is held in solution, which may be again converted into the basic salt by digesting it with oxide of lead.

The method practised in Holland and Belgium is to twist the sheet-lead into spiral forms, and to place these in earthen pots containing some vinegar; these vessels are then buried in putrefying horse-dung. In most of the lead-works of Germany the leaves of lead are hung up in wooden chests over vinegar, and the boxes are exposed to a certain temperature. Other works have large heated rooms, in which the leaves of lead are hung up; the floor is covered with a layer of tan, through which vinegar is allowed to pass very slowly. Metallic lead, in contact with vapours of acetic acid, forms carbonate of lead; the process proceeds from the surface inwards; the product contains a little acetate and metallic lead; from the former it is freed by washing with water, and from the latter by suspending it in water.

The process of Gossage and Benson is to mix common litharge with a very small quantity of acetate of lead and water, so as to form a thick paste, over which carbonic acid (prepared by burning coke) is passed: this is evidently only a modification of the French method. The explanation of this manufacture must be as follows:—Carbonic acid and oxide of lead combine very slowly, and we must therefore suppose that the small quantity of acetate dispersed through the whole mass is converted into basic acetate, which is decomposed by the carbonic acid into carbonate and neutral acetate, and that the basic acetate is thus continually regenerated and then decomposed.

With regard to the chemical process, in the method pursued in Holland, ideas are entertained at present very different from those which were formerly considered correct, and for this reformation we are indebted to Liebig and Pelouze. It was formerly believed that the acetic acid furnished the carbonic acid, and the atmosphere the oxygen, but an extremely weak kind of vinegar is used for the



purpose, and the quantity of acetic acid is not at all proportional to the mass of lead which is operated on. The fact is that the lead is oxidized by the action of the air, the oxide unites with acetic acid, forming a basic acetate, and this is continually being decomposed (and regenerated) by the carbonic acid evolved from the fermenting horse-dung, or from the decomposition of the animal matters which always accompany the impure vinegar employed. It is evident that the reason why acetic acid is used, is that it forms a basic salt decomposable by carbonic acid into carbonate and neutral acetate: an acid which does not form a basic salt is therefore inapplicable. Pelouze was unable to form any white lead when formic acid was substituted for acetic acid, although these acids agree in most of their properties, and the former is more volatile.

The only questionable point in the above explanation is the oxidation of the lead in the first instance, for it seems somewhat improbable that the air should have access to the lead when buried in horse-dung, which is moreover constantly evolving carbonic acid.

Hochstetter has made some experiments on this subject. Finely divided lead, moistened with acetic acid, was placed in a bottle maintained at a temperature of  $86^{\circ}$  to  $104^{\circ}$  Fahr., and which was freed from atmospheric air by a current of carbonic acid passing continually through it. The lead underwent no change whatever, but directly air was admitted its surface became dull, and, after a few hours white, carbonate of lead being formed.

The different kinds of white lead contain very variable quantities of neutral acetate of lead, and Hochstetter has also attempted to give an explanation of this phenomenon. He found that acetate of lead is decomposed by exposure to the air, acetic acid passing off in vapour and carbonate of lead being formed; and this decomposition is the more energetic the greater the quantity of moisture present in the atmosphere. He therefore concludes that those kinds of white lead which contain a large quantity of acetate have not been placed in circumstances so favourable to the decomposition of the acetate as those which contain very little.

The quantity of acetate in white lead of those factories where horse-dung is used, is much less than that manufactured by putting the lead in chests, as mentioned above. In some works the process is conducted so well that the white lead contains no acetate at all.

Hochstetter is of opinion that the formation of this substance depends upon three circumstances:—

1. The formation of a basic acetate of lead.
2. The decomposition of this salt by carbonic acid into white lead and neutral acetate of lead.
3. The decomposition of the neutral acetate by carbonic acid, and the vapours of water, into acetic acid and carbonate of lead.

Robiquet and Pfaff stated that the white lead prepared in Holland was a basic carbonate; Bischoff considered it as a neutral salt; Mulder found it to be a combination of neutral carbonate with hydrated oxide, with some extraneous impurities. A good white lead consisted of  $\text{Pb O, H O} + 2 \text{ PbO, CO}^2$ .



A very excellent compound, prepared by Stratingh, and which had not only a very beautiful white colour, but also was not altered by exposure to the air, had the formula  $\text{Pb O}, \text{H O} + 3 \text{Pb O}, \text{C O}^2$ . These compounds absorb carbonic acid when exposed in a moist state to the air, but are not wholly converted into neutral carbonate. Bonsdorff formerly described the third compound of this series, viz.  $\text{Pb O}, \text{H O} + \text{Pb O}, \text{C O}^2$ ; it was obtained by exposing oxide of lead, covered with water, to the air for a long time. The oxide changes into a voluminous substance, which however possesses no body, and does not cover well. Mulder found in the white lead of Stratingh a little acetate; in that from Holland a trace of chloride of calcium, sulphate and sulphuret of lead, and also metallic lead. [In England the mixture of horse-dung and litter has been rejected, and tan used instead; the dung was apt to evolve sulphuretted hydrogen.] The white of Krems is often coloured by a little indigo, added to it purposely. The French white is neutral carbonate of lead. According to Mulder, the greater the quantity of hydrate contained in the salt, the easier is it acted upon by sulphuretted hydrogen, &c. Another important point in the value of white lead is its covering power. Payen and Ure found the neutral carbonate obtained by precipitation to be semi-crystalline and transparent, which therefore does not cover well. To cover fully, the preparation must be perfectly amorphous, and consequently the white lead from Holland is preferable to the French compound. Benson's white lead, as also that prepared according to Button's patent (by means of nitrate and subnitrate of lead instead of acetate), are also amorphous. Hochstetter has examined the chemical composition of the various kinds of white lead, but he comes to the conclusion that most of them are mixtures of carbonate of lead with a salt whose formula is  $2 \text{Pb O}, \text{C O}^2 + \text{Pb O}, \text{H O}$ , i. e. two atoms of carbonate with one of hydrate. This salt is obtained very generally. In passing a current of carbonic acid gas through a solution of basic acetate of lead, this compound is first precipitated; if the gas be passed in for a length of time until litmus is reddened, it is converted into the neutral carbonate; it is also formed by precipitating basic acetate with carbonate of soda: it is immaterial for these experiments whether the di- or tri-acetate is used. Hochstetter believes that the acetic acid found in most kinds of white lead is present in the state of neutral acetate, not as hexi-acetate,  $\text{Ac} + 6 \text{Pb O}$ . The acetic acid may be determined in the following manner:—The salt is boiled with excess of milk of lime and filtered; the solution contains lime and its acetate; carbonic acid is passed through the solution, which precipitates the free lime; the solution evaporated gives acetate of lime, from which the acetic acid may be calculated; or else the white lead may be decomposed by sulphuric acid, the excess precipitated by caustic baryta, filtered, and carbonic acid passed through the solution to throw down excess of the earth; the liquid evaporated gives acetate of baryta.

White lead is frequently mixed with sulphate of baryta and chalk. The former is detected by dissolving in nitric acid; the residue is the



sulphate; the nitric acid solution, evaporated to dryness and treated with alcohol, yields nitrate of lime to this solvent if chalk had been present.

According to Hochstetter and Marchand, the state of aggregation of white lead has no effect upon its covering power, which is contrary to the opinions of Ure and Payen mentioned above.—Liebig, *Handwörterbuch der Chemie*, Art. *Bleweiss*; Pelouze, *Compt. Rend.* xiii. p. 1051; Schubarth, *Journ. für Prakt. Chem.*, xxiv. p. 328; Hochstetter, *Journ. für Prakt. Chem.*, xxvi. p. 338.

### *Preparation of the Purple of Cassius.*

The extensive use of this preparation in colouring glass and porcelain has rendered its best and most economical preparation a subject of interest both to the chemist and the manufacturer. Although the determination of its true chemical composition has presented obstacles almost insuperable, still many important points with regard to its manufacture have been elucidated. It has been found that the tin salt used in precipitating it must contain both the binoxide and protoxide of tin in certain proportions, and it has been also discovered that the degree of dilution both of the gold and tin solutions exerts a very perceptible influence on the beauty of the preparation. Capaun has examined this latter point with great attention, as he tested all the different products as to their power of colouring glass.

The first point to be attained is the preparation of a solution of sesquioxide of tin; and for this purpose Bolley proposes to employ the double compound of bichloride of tin with sal-ammoniac (pink salt). This salt is not altered by exposure to the atmosphere, and contains a fixed and known quantity of bichloride of tin, and when boiled with metallic tin it takes up so much as will form the protochloride; as the exact quantity of the bichloride is known, it is very easy to use exactly such a quantity of tin as will serve to form the sesquichloride. 100 parts of pink salt require for this purpose 10·7 parts of metallic tin.

1·34 gr. of gold was dissolved in aqua regia, an excess being carefully avoided, and the solution diluted with 480 grs. of water, which is the proportion recommended by Capaun. 10 grs. of pink salt were mixed with 1·07 gr. of tin filings and 40 grs. of water, and the whole boiled till the tin was dissolved. 140 grs. of water were then added to this, and the solution gradually added to the gold liquor, slightly warmed, until no more precipitation ensued. The precipitate was washed and dried; it weighed 4·92 grs. and was dark brown coloured. This method of preparing a solution of the sesquioxide of tin for this purpose is evidently the best that has been yet proposed.—*Ann. der Chem. und Pharm.*, xxxix.

### *Preparation of Selenium.*

Wöhler proposes the following mode of preparing selenium from its combination with lead:—The ore is first pulverised and extracted



with dilute hydrochloric acid, and dried. It is then mixed with an equal weight of carbonized cream of tartar, and being covered with coarsely powdered charcoal, is kept moderately red-hot for an hour; when cold it is pulverised, and washed with hot water as long as it becomes coloured: the mass must always be kept covered with water. The cooled solution of seleniuret of potassium, when exposed to the air, forms a pellicle of selenium, which subsides, and is again renewed, and this continues until the solution becomes colourless. This impure selenium may be purified by distillation. A small quantity remains in the liquid, probably in the form of selenite of potassa; this may be obtained by means of sulphurous acid, warming the solution and supersaturating with hydrochloric acid. The seleniuret of lead often contains silver, which remains behind with the lead after the fusion; from this mixture it may be easily obtained by driving off the lead.

Otto obtained a considerable quantity of selenium from the deposits in the lead chambers of the sulphuric acid works on the Harz mountains, in which they employ the sulphurous acid obtained by roasting the ores from the Rammelsberg mine. From 500 grs. of deposit he obtained 29 grs. selenium. It contains, moreover, mercury, antimony, copper, iron, a large quantity of lead, and a little zinc. The sulphuric acid itself contains arsenic. In order to prepare the selenium, the deposit was washed with water, dried, and digested with aqua regia and a little sulphuric acid, the greater part of the acid driven off, and the residue extracted with water. Sulphite of ammonia throws down from this solution a white or reddish powder, which contains mercury, chlorine, and selenium. To the filtered liquid concentrated sulphuric acid is added, by which the selenium is precipitated as a dark red powder. Concentrated sulphuric acid with sulphite of ammonia forms a very good reagent, both for detecting and separating selenium.—*Journ. für Prakt. Chem.*, xxvi. p. 52.

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## REVIEWS.

*Toxicological Chart, exhibiting the Symptoms, Treatment, and Modes of detecting the various Poisons, Mineral, Vegetable and Animal; to which are added concise Directions for the Treatment of suspended Animation.* By WILLIAM STOWE, M.L.C.S. Highley, London.

THE medical practitioner who may be called in to a case of poisoning, perhaps in situations where he cannot apply for aid to a professed chemist, is obliged to examine the body or the substances ejected from it himself; and as it is very usual for our medical men to be somewhat *rusty* in their chemistry, from the amount of time required by their other avocations, he is frequently compelled to have recourse to books, and in looking for the tests for the various poisons has to hunt through some ponderous volumes, and read many a lengthy passage, before he arrives at the information for which he



is seeking. As a remedy for this evil Mr. Stowe's Chart appears to be eminently useful (perhaps it might have been more commodious if published in the form of a pamphlet). All the principal mineral poisons, the symptoms produced by them, the best treatment, and the means for their discovery, are represented in a well-arranged table\*. Tables are given of the vegetable narcotic and irritating poisons, poisonous mushrooms, fish, insects, &c., and the whole concludes with some remarks on restoring suspended animation, as produced by a variety of causes. It is a work which can be safely recommended for its utility and completeness.

*Selecta è Præscriptis. Selections from Physicians' Prescriptions.*  
Highley, London. 32mo, 8th edition.

This little work is intended for the use of those gentlemen of the medical profession who are just commencing their apprenticeship, and who are engaged in the irksome duties of the dispensary. Even to a good Latin scholar, the extraordinary phrases and contractions of physicians' prescriptions offer at first considerable difficulties; and it is for the purpose of overcoming these that the work in question has been written. It contains all the usual medical phrases, with their translations, an immense number of prescriptions of all kinds, and is accompanied by some notes often well worthy of attention.

Its having already run through seven editions is a sufficient proof of its value and utility, and renders all further notice unnecessary.

*English Patents; being a register of all those granted in 1841, &c.*  
By ANDREW PRITCHARD, M.R.I. London, Whittaker and Co.

The present little work is a continuation of the author's useful 'List of all the Patents granted during the present Century.' Of its importance and value we need not speak, as they will be self-evident to the manufacturer, and those persons engaged in applying new discoveries or scientific principles to practical purposes; it will enable the former, at a glance, to ascertain what processes and articles he is restricted from using or making, and the period when they become public property; while to the latter it offers a ready means of finding out whether others have directed their attention to the same subjects, and if so, whether the inventions are similar, or what parts have been claimed by former patentees. The work is divided into four parts:—1. A list of English patents arranged alphabetically. 2. A list of patents granted for the importation of inventions from foreign countries. 3. A copy of the form of letters-patent as now granted for England, and an abstract of the new Act for securing to proprietors the sole use of designs for articles of manufacture; and, 4. A copious index, forming altogether a neat and useful little book.

\* For the tests for arsenic vide our first Number, and a continuation of the paper in our next.



*An Easy Introduction to Chemistry.* By GEORGE SPARKES, late Madras Civil Service. Whittaker and Co.

At the present day the writing a good elementary treatise on Chemistry for the sole use of beginners, is almost, or perhaps quite as difficult as to compose a perfect system of the science. There is a great difficulty in steering between a too superficial and a too scientific treatment of the subject. With regard to this point, however, Mr. Sparkes seems to have succeeded tolerably well, and his work is written in a style easily to be understood by the veriest tyro. But there is another point to be considered in writing an introduction for the present generation, which is, that the statements should be *correct*; for there is nothing so disheartening to the beginner as to find, after he has learned one book, that when he advances further he has to unlearn a great part of it. In this respect Mr. Sparkes has somewhat failed. The work contains a number of mistakes, and the progress of chemistry during the last five years seems to have been rather neglected.

## PATENTS.

*Patent granted to John Bethell, of St. John's Hill, Surrey, for improvements in preparing certain Oils and fatty Matters.*

THESE consist in rendering whale oils, rape seed, teel, olive, palm, cocoa-nut, or any of the common oils, more useful for lubricating machinery, and for purposes of illumination.

In the first process the oils are well mixed with a strong infusion of nut-galls; the clear oil, after settlement, drawn off the precipitate, and well agitated with a solution of either acetate of lead, acetate of alumina, or sulphate of zinc. During these operations the oil should be kept as near 70° Fahr. as possible. After sufficient resting the oil is drawn off, and if found to contain too much water, agitated with fresh calcined sulphate of lime or well-dried carbonate of soda, which are allowed to precipitate by rest. In the second process, to the oil thus purified are added from 5 to 10 per cent. of either of the following essential oils or hydrocarbons:—petroleum, Persian naphtha, fine oil of turpentine, or the best essential oil obtained from the distillation of coal. These are intimately intermixed either by agitation or by passing the hydrocarbon in the form of vapour into the oil. For a good burning oil the two processes are necessary; for a lubricating oil, only the first.

In preparing the fatty matters, as butter of palm, or rough palm oil, or rough cocoa-nut oil, or any other concrete vegetable oils, these are mixed with about 20 per cent. of any of the above essential oils, and subjected to distillation by means of steam; the essential oil and the volatile matter arising from the palm or cocoa-nut oil, which pass over, are condensed, and used for mixing with the oil for burning in lamps, as described in the second process. Enrolled Sept. 1840.



*Patent granted to John S. Tough, Baltimore, Maryland, May 11, for an improvement in the Argand Lamp, for burning Spirits of Turpentine, &c.*

“The reservoir and burner are made in the usual manner of Argand’s lamp, except the outer cylinder of the latter, which is made about an inch higher than the inner cylinder, and slightly flaring outward. The principal improvements are in the construction and arrangement of a sliding cylinder, which fits the inner cylinder of the Argand’s burner, having its upper end enlarged, so as to fit the space between the inner and outer cylinders of the burner, being flared outward, so as to press the wick against the inside of the outer cylinder, which is also made slightly flaring outward, as before noticed, provided with a funnel-shaped button, or inverted conical regulator, which slides up and down, for concentrating the air around the flame, and increasing its intensity, and a glass globe, with a circular rim inside the same, made in the form of a hollow frustum of a cone rising inward from the lower rim of the globe, for contracting the space and impinging the column of air around the flame; the slope of said flanch extending downward from the flame, outside the wick, whilst the slope of the button extends also down from the flame, but inside the circle of the wick.”

*Patent granted to S. J. Gold, of Connecticut, for improvements in the Argand Burner, for burning camphine and other chemical Oils.*

The claim is to the “mode of compressing the wick by means of two thin moveable metallic cylindrical tubes combined with the wick-case; the two cylinders, or wick tubes, with the wick compressed between them, being inserted into the annular space between the two cylinders of the wick-case, with a portion of the said wick-tubes extending above the wick-case, to allow of their being kept cool by the draught, and also for combining with the outer cylinder of the burner and the rod supporting the bottom a moveable cylinder or screw, disconnected from the rod, but having a button plate, which, when the cylinder is turned up, presses against the rod and elevates it, and allows it, when turned down, to return either by its own weight or by the action of a spring.”

*Patent granted to Francis and Hanson Robinson, Wilmington, Delaware, May 15, for an improvement in the process for removing Wool and Hair from the Skins of Animals.*

“We do not claim the use of any particular apparatus for carrying the same into effect, but employ such instruments and means as are now known and used for other purposes; but what we do claim, and desire to secure by letters patent, is the process of loosening the wool or hair from skins or hides by the direct application of steam thereto; said skins or hides being suspended in any suitable room, or apartment into which steam can be admitted.”



# THE CHEMICAL GAZETTE.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On Urea, and on the Non-existence of the Lactate of Urea in the Urine.*  
By M. PELOUZE.

WE know from the experiments of Regnault, that urea, like ammonia and the vegetable alkaloids, in combining with oxy-acids forms salts, into the constitution of which invariably 1 equivalent of water enters. The lactate of urea would be the sole exception to this rule. MM. Cap and Henry regard this salt as formed of 1 equiv. urea and of 1 equiv. anhydrous lactic acid without any water of combination. They did not make any direct analysis of it, but deduced its composition from the quantities of lactate of lime and of oxalate of urea requisite to produce exactly the double decomposition of the two salts. On repeating the calculations upon which their opinion is based, it was evident that they were erroneous; and consequently nothing can be concluded from their experiments as to the composition of the lactate of urea; and even were their calculations exact, their method would not possess sufficient precision to solve so delicate a question.

On dissolving some urea in water, and adding to it a slight excess of lactic acid, to form the lactate for analysis in the usual way, I found, on evaporating *in vacuo* at the common temperature, to my great astonishment, white crystals of *pure* urea, having its composition and all its properties. Although thus led to doubt the existence of lactate of urea, I endeavoured to prepare it by double decomposition. I decomposed lactate of lime with oxalate of urea. On removing the oxalate of lime the liquid was acid; it was evaporated *in vacuo*, but remained viscous, and deposited some few needles of pure urea. It seems therefore that lactate of urea does not exist, and that Cap and Henry have mistaken urea, pure or simply impregnated with lactic acid, for this salt. MM. Cap and Henry announced the existence of lactate of urea in considerable quantity in the human urine, an error which has already been adopted by numerous chemists and physiologists. Lecanu, it is true, has shown, in an interesting memoir on urine, that the two substances exist in a perfectly uncombined state. According to them the urine of ruminating animals contains the urea in the form of hippurate, and in the excrements of birds and reptiles it is said



to be in combination with uric acid. Both these assertions are likewise without foundation. I convinced myself that when hippuric and uric acids are dissolved in water, and then mixed with urea in the relation of equivalent for equivalent, that these two acids are the first to separate in a state of purity from the aqueous solution, while the urea is concentrated in the mother liquor, in which it is found in a free state.

When the mixture of hippuric acid and urea in atomic proportions is boiled, a portion of the latter is decomposed into carbonate of ammonia, which again is a new proof of the non-production of the hippurate; nor can this salt be formed by the double decomposition of the hippurate of lime and oxalate of ammonia.

Urea therefore behaves towards certain acids like a base; it is to them a true organic alkali; but this base is exceedingly feeble, and it is therefore not surprising that for some acids it has a decided predilection, while for others it possesses not the slightest affinity, especially when in these the acid properties are but slightly developed.

What has been said of urea is likewise applicable to the vegetable alkaloids, which are also weak bases. It might perhaps be necessary to make a revision of the alkaloid salts, the more so as many of them are frequently employed in medicine, as for instance the ferrocyanate of quinine. I examined several samples of this taken from the shops of Paris, and found it to be nothing more than quinine, which contained a little prussian blue, resulting in all probability from the decomposition of the hydroferrocyanic acid.

Having shown that the experiments of Regnault as to the necessity of the presence of water in the oxy-salts of urea are correct, and are not subject to any exception, it was important to examine whether the analogy of urea with ammonia and the vegetable alkalies would continue to exist in its relations with the hydracids. The analogy was perfect with dry urea and hydrochloric acid gas. I obtained a salt formed of equal equivalents of the two substances, having therefore for formula  $C^2 H^4 N^2 O^2, H Cl$ . But as with certain oxy-acids, so with weak hydracids urea cannot combine: I could not obtain any compound with hydrosulphuric acid.

Urea presented, when in contact with salts containing water of crystallization, a peculiarity worthy of notice: when powdered and mixed with these salts it immediately separates the water of crystallization from them, and the mass from being solid becomes all at once soft, or even liquid when the hydrated salt, as for instance the sulphate of soda, contains much water. Nevertheless urea cannot combine with water; when exposed to the atmosphere it does not attract any sensible quantity of humidity; it is therefore curious to find it displace water in a state of combination in order to dissolve therein.

Nitrate of urea, when heated to about  $316^{\circ}$  Fahr., decomposes and disengages a considerable quantity of carbonic acid and protoxide of nitrogen in the exact proportion of 2 volumes of the first to 1 of the latter; the residue consists of free urea and of nitrate of ammonia, a fact which has been already noticed. This residue is



very soluble in water and deliquescent; the nitric acid causes an abundant crystalline precipitate of the nitrate of urea. Nitrate of ammonia and free urea crystallize successively out of the solution. The following equation will explain the first period of the decomposition of the nitrate of urea:— $4 (\text{C}^2 \text{N}^2 \text{H}^4 \text{O}^2, \text{N O}^5, \text{H O}) = 4 \text{C O}^2 + 2 \text{N O} + 2 (\text{C}^2 \text{N}^2 \text{H}^4 \text{O}^2) + 3 (\text{H}^8 \text{N}, \text{N O}^5, \text{H O})$ . The nitrate of ammonia subsequently changes into water and a new quantity of the protoxide of nitrogen, while the urea affords carbonic acid and ammonia.

I observed that urea in presence of nitrate of ammonia does not afford any cyanuric acid; this acid when alone resists a very high temperature previous to its change into cyanic acid, but when mixed with nitrate of ammonia it is easily destroyed. I may add, that there are few salts which support combustion so energetically as the salt last mentioned.

During the decomposition of the nitrate of urea a new acid is formed in extremely small quantities; it crystallizes in white or grayish white brilliant lamellæ of scarcely any taste, reddens turmeric, and is very little soluble in water, which allows of its being separated from the urea and nitrate of ammonia. It evolves ammonia when heated with potassa, forms large white precipitates with the tribasic acetate of lead and with ammoniacal nitrate of silver; submitted to dry distillation it affords acid products, and disappears without leaving any residue. It appeared to me to be formed in the following manner:  $\text{C}^2 \text{H}^3 \text{N}^2 \text{O}^4$ ; but I am far from regarding this formula as definitive. My only motive in mentioning this acid was to draw attention to the products resulting from the dry distillation of the nitrate of urea.—*Ann. de Chem. et de Phys.*, Sept. 1842.

### *Tests for Arsenic.*

A new method of reducing compounds of arsenic and obtaining the metallic films will be found in the paper of MM. Haidlen and Fresenius. For the sake of completing the paper on the tests of arsenic in our first Number, the following notices may be added.

Meillet prepares pure zinc by first fusing commercial zinc and throwing it into hot water, by which it is obtained in the form of large grains. These are placed in a Hessian crucible, with alternate layers of saltpetre, equal to a quarter their weight; the crucible is covered and heated until the nitre burns and the zinc is perfectly fused; the slag is then removed, and the perfectly pure zinc poured out. Fordos and Gélis have remarked that the purest zinc, when treated with strong sulphuric acid, gives off traces of sulphuretted hydrogen, arising from the reduction of the sulphuric acid. Hydrochloric acid, which, as is well known, often contains sulphurous acid, also gives traces of the same gas, evidently derived from the sulphurous acid. Chevallier had already proved that Marsh's apparatus is not applicable to testing for arsenic when it is in the form of sulphuret; and consequently if much sulphuretted hydrogen were formed, the whole of the arsenic present would be converted into



sulphuret, and the spots obtained would be yellowish. The spots obtained by Danger and Flandin are referable to this cause; the organic matters not being completely carbonized, sulphite of ammonia was produced; the sulphurous acid by its reduction gave rise to sulphur, and consequently sulphuret of arsenic, and the spots were therefore yellow.

Wackenroder has proposed several methods to determine whether the spots obtained are owing to arsenic or to antimony; the only one which need be noticed depends on the crystalline form of arsenious acid. A metallic film having been produced, the tube (open at both ends) is held in a slanting position, and the ring is heated; a deposit is produced some distance from the place where the ring was, and which may be either arsenious acid or oxide of antimony. The tube is carefully broken, and one of the pieces brought under a microscope with a magnifying power of 200. If the crystals are regular octohedrons, they are arsenious acid; but if prismatic, oxide of antimony. This oxide never forms octohedral crystals, but only prisms.—*Pharm. Cent. Blatt.*, 1842, 447.

### *On Testing for Arsenic in Cases of Poisoning.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

Stowe, in his 'Toxicological Chart,' directs a bottle and tobacco-pipe for the formation of arseniuretted hydrogen, to burn for the analysis of arsenic. Now it appears to me unsafe to apply the light at first, as the mixture of arseniuretted hydrogen and atmospheric air would explode. If the mixed gas is allowed to evolve, may not all the arsenic escape if the proportion of it is small? and seeing that Gehlen, the German chemist, was poisoned by a little arseniuretted hydrogen escaping, might not a person following Stowe's directions be poisoned by the little mixed gas that is given off before the light is applied? These difficulties are obviated by Marsh's apparatus, which I think Stowe would have done better to have recommended.

*Ely, Nov. 17th, 1842.*

SAMUEL STURTON.

In answer to our Correspondent, we believe that no person would use a tobacco-pipe in testing for arsenic if he were in possession of a glass tube, and that Mr. Stowe's arrangement is intended rather as one of convenience than of accuracy. There does not seem however any reason why his apparatus should not answer the purpose as well as a neater but more expensive one. With regard to the evolution of arseniuretted hydrogen, the objection applies equally to all the arrangements generally used, particularly to Marsh's. The best method appears to be, to evolve the gas from any convenient vessel, and let it pass through a glass tube, part of which is heated to redness, when a metallic film is obtained; the tube may be cut off and fixed on to a bottle in which sulphuretted hydrogen is being generated. Pettenkofer's test may thus be employed. The conjoined evidence of the two methods would certainly be conclusive.



*On the Oxide of Omichyle.* By M. SCHARLING.

The substance to which this name has been applied forms the red resinous matter of urine. To obtain it, urine concentrated by freezing is mixed with an equal quantity of æther, and the mixture left to itself for 24 to 28 hours, being frequently shaken; the æther dissolves a portion of the oxide of omichyle, and at the same time some urea and other substances which were not determined. The treatment with æther is repeated several times, then removed by distillation, and the residue first washed with cold water and then with hot, which removes the urea, and the greater portion of the substances with which it is contaminated, without dissolving the oxide of omichyle. In order to decompose the ammoniacal salts which still remain with the omichyle, the whole is dissolved in caustic potash, the solution heated to boiling, and subsequently precipitated with weak sulphuric acid. The oxide of omichyle then separates in brown flakes; these are now collected on a filter, edulcorated, dried, and dissolved in æther; the solution filtered and evaporated after having been mixed with a little distilled water. Pure oxide of omichyle melts in boiling water to a brownish yellow oil, which on cooling acquires the hardness of a resin; it is soluble in æther, alcohol, solutions of ammonia, of weak caustic and carbonated potash and soda. The alcoholic solution has an acid action, when dry has a strong smell of castoreum, but when boiled with water it gives off a slight odour of urine; when the solution in æther is mixed with a very small quantity of oil of turpentine, the mixture assumes, on the evaporation of the æther, an insipid aromatic smell, resembling that of the urine when oil of turpentine or juniper berries have been partaken of.

When the oxide of omichyle, moistened with a little water, is exposed to a temperature at which it commences to be decomposed, it disengages a strong and penetrating odour of old urine. Heated more strongly it inflames and burns with a very brilliant white flame; heated to redness it leaves but a slight trace of ash. When boiled with *aqua regia* it forms a yellow semi-fluid resin (chloromichylic resin). The small quantity of oxide of omichyle which M. Scharling was able to obtain, prevented him from making an elementary analysis of it.—*Ann. der Chem. und Pharm.*, xlii. p. 265.

*Urine during the State of Pregnancy.*

Lubanski states that the urine during pregnancy is generally clearer, less acid, sometimes neutral and even alkaline, and that salts of lime occur in it in smaller quantity. Donn  found that at least one-third more salts of lime might be precipitated from normal urine than from urine of pregnant persons. Previous to precipitation it should naturally be rendered weakly alkaline by the addition of ammonia. Both chemists believe that this circumstance may be used as a diagnostic, and suspect that it is connected with the formation of the bones in the f etus.—*Ann. d'Obst tr.*, 1842, No. I.



*On the red colouring Principle of Cactus Opuntia.* By M. WITT-STEIN.

It seemed of interest to ascertain whether the colouring matter of cochineal might perhaps be extracted from the *Cactus* itself, and the following experiments were instituted for that purpose.

The sap of the green branches of *Cactus Opuntia* is coloured yellow by alkalis, and becomes green again by acids; but neither by long exposure to the air nor to heat does it furnish a red pigment. Even alcohol only extracts a green matter from the branches, which changes to yellow when acted on by alkalis. The sap of the unripe fruit, on which exudations resembling tragacanth are sometimes found, acts precisely in a similar manner. The ripe fruit are of a pale purple red, and discharge a red, viscid neutral sap. Neither æther nor absolute alcohol extracts the red colouring matter, but alcohol of sp. gr. 0.863 does, although not entirely. Water extracts it completely, and from this alcohol precipitates a white flaky mass, which is converted into yellow by alkalis and reddened by acids; nitric acid destroys the colour, and on evaporation it becomes of a brownish yellow, and does not acquire its red colour by treatment with acids. A solution of tin turns the red solution violet, and on adding alum a dirty violet-coloured precipitate is gradually formed. A solution of alum alone affords no precipitate even in a decoction of the fruit made in tin vessels. Carbonate of potassa produces a dirty white precipitate. The alcoholic extract also undergoes change by boiling.

It is therefore evident that the colouring principle of the *Cactus* differs totally from that of the cochineal, and that it is moreover useless in the arts. It seems as if it became first fixed and animalized in the insect. An examination of the red coloured urine, which is secreted after partaking of the *Cactus* fruit, might afford some information on this point.—Buch. *Rept.*, xxii.

*Reduction of Salts of Platina by means of Zinc, according to Parisot.*

M. Böttcher found this method exceedingly practical, both for decomposing the potassio-chloride as well as the ammonio-chloride of platinum, and also the liquid resulting from the edulcoration of the latter. A little sulphuric acid is added, and a piece of sheet zinc thrown into the liquid; the platina is thrown down as platinum black, and the liquid decolorized. Any zinc mechanically mixed with the precipitate may be removed by digesting and washing with hydrochloric acid.—*Annal. der Pharm.*, xxxvii. p. 116.

*Superacetate of Soda in the Wrappings of a Mummy.*  
By HENRY JOHNSON, M.D.\*

On moistening a portion of mummy-cloth with distilled water and applying litmus paper, the latter became reddened, proving the pre-

\* Original communication.



sence of a free acid: the same effect was observed in several different portions of the material. I desired therefore to know what was the nature of this acid.

*a.* Some of the mummy-cloth was infused in cold distilled water; the liquor reddened litmus, and effervesced with bicarbonate of potass; evaporated to an extract and mixed with strong sulphuric acid, it yielded fumes which were recognised as *acetic* or *pyroligneous acid* by the smell.

*b.* A portion of the liquor (*a.*) was distilled in glass vessels. A transparent, feebly-acid liquor came over, which, being free from the vegeto-animal matters dissolved by the water, seemed to afford the usual reactions of acetic acid.

It gave no precipitate with solution of acetate of lead, muriate of baryta, or nitrate of silver (except when concentrated, in which case it was crystalline).

The liquid remaining in the retort was more strongly acid than what came over in distillation; it contained much animal or vegetable matter, imparting to it a high colour. It was saturated with bicarbonate of potass and then evaporated to an extract; and on adding sulphuric acid, the pungent and characteristic vapours of acetic acid were distinctly perceived. The acid here present could therefore be none but the acetic\*.

On referring to Mr. Pettigrew's work (p. 76), I find that M. Rouelle obtained an acid liquor by distilling the bituminous matter contained in a mummy. He does not state what was the nature of this acid; and, it may be remarked, that as obtained by him, in the destructive distillation of these substances, the acid and oil which he describes as coming over were probably not contained in the materials of the mummy, but were *produced* in the process. They were *products*, not *educts*, of the distillation. Mr. Pettigrew (p. 62) conjectures that a considerable heat was employed in the making of mummies; and M. Rouyer, whom he quotes, supposes that the bodies must have been put into stoves in order to bring about a union of the resinous and animal matters.

What Mr. Pettigrew and M. Rouyer conjecture we may now, I think, positively assert:—1, because the mummy recently opened here (in Shrewsbury) by Mr. Birch had evidently been quite charred; and of this a piece of the bandage now before me affords visible and indubitable evidence; 2, the presence of acetic or pyroligneous acid in the wrappings is another proof of the fact. The charred state of the wrappings proves that after their application the body has been subjected to a heat equal at least to 300° F. This temperature would decompose a part of the pitch and resinous substances, and produce a quantity of acetic or pyroligneous acid besides other matters, such as empyreumatic oil and creosote. The utility of this operation is quite obvious: it would not only cause the bitumen and resin to melt and combine with the animal matter of the corpse, but the abundant escape of pyroligneous acid, creos-

\* See Parnell's Elements of Chemical Analysis, pp. 46, 47.



ote, &c., and the impregnation of the whole mummy and its wrappings with this would greatly tend to preserve the body from decay. Hence it appears that mummies were prepared or "*cured*" much in the same way that Westphalia and other hams are at the present day; namely, by pyroligneous acid, and, as suggested by Mr. Cormack, by creosote\*.

The peculiar yellow colour of the bandages I have no doubt is produced in the operation of "smoking" the mummy, and arises from the empyreumatic, oily, and some extractive matter dissolved by the acetic acid as it is evolved. The colouring matter is soluble in water and in alcohol, and seems therefore to resemble extractive matter of chemists. Solution of persulphate of iron deepens the colour but does not render it black; hence it cannot be astringent matter.

Herodotus tells us the body of the mummy was covered with nitre or natron, *i. e.* native carbonate of soda. The truth of his statement is borne out by the crystals collected and analysed by Dr. Grenville, and the examination of a saline matter discovered by Dr. Ure. Saline particles were also discovered in the opening of the mummy here (in Shrewsbury), but unfortunately they have been lost.

If the account given by Herodotus be true, that the body was covered with carbonate of soda, and as I have endeavoured to show, acetic acid would be produced and given out in the process of embalming, the carbonate of soda would be converted into acetate, or from the excess of acid into the superacetate of soda; and that this has happened I have proved to my own satisfaction by the following experiments:—

Some of the wrappings were digested for an hour in distilled water. The liquor was evaporated to dryness. When much concentrated it was found decidedly acid. The solid extract weighing 7 grs., was heated to redness and thus reduced to a white ash mixed with some charcoal. The ash effervesced with muriatic acid; it dissolved in water, and the solution rendered turmeric paper brown, and restored the blue of litmus reddened by an acid. Evaporated to dryness, it left a white crust, not deliquescent, but soluble in water. The solution exhaled bubbles of carbonic acid on the addition of a drop of pure muriatic acid; and this solution gave no precipitate with solution of muriate of platinum. It was therefore carbonate of soda, and no doubt some of the natron, which had been used in the preparation of this mummy more than 2000 years ago.

It remains for others to verify these results by similar experiments on other mummies.

\* According to Mr. J. R. Cormack (Treatise on Creosote, 1836), the only essential part of the mummifying process practised by the Egyptians was the application of such a heat as would first dry up the body, and then decompose the tannin matters which had been previously introduced, and thus generate creosote.—Pereira, *Mat. Med.*, Part I. p. 227.



## ANALYTICAL CHEMISTRY.

*On the Use of Cyanide of Potassium in Analysis.*

[Continued from p. 40.]

1. THIS salt is undoubtedly the best reagent for detecting the presence of nickel in cobalt. The solution of the two metals is acidulated, and the cyanide added until the precipitate at first produced is redissolved; dilute sulphuric acid is then mixed with it, and the whole warmed and allowed to stand. A precipitate appearing, either immediately or after some time, shows the presence of nickel in a very accurate and evident manner, whether the precipitate be cobalto-cyanide or only cyanide of nickel.

2. Cyanide of potassium is extremely well adapted for the separation of those four metals which are obtained dissolved in nitric acid, in the usual course of analytical investigations, viz. lead, bismuth, copper, and cadmium. Cyanide is added in excess, by which lead and bismuth are fully precipitated as carbonates, while copper and cadmium are dissolved. Lead and bismuth may be separated by means of sulphuric acid. Sulphuretted hydrogen in excess is added to the solution of cadmium and copper, the whole heated, and a small additional quantity of cyanide added; a yellow precipitate indicates cadmium; and if the hydrochloric acid, when added to the filtered solution, produces a black precipitate, copper is also present.

*In Quantitative Chemistry.*

All the methods here mentioned effect absolute separation.

1. *Zinc from Lime, Baryta, and Strontia.*—The mixed solution is treated with carbonate of potassa until it acquires an alkaline reaction; cyanide is then added in excess and heat applied. The earthy carbonates remain undissolved, while that of zinc is taken up. The solution is boiled with hydrochloric and nitric acids until all hydrocyanic acid is expelled, and the oxide of zinc precipitated with carbonate of soda, those precautions being taken which are always necessary when a salt of ammonia is present.

2. *Zinc from Magnesia.*—The oxides are precipitated by carbonate of potassa; a quantity of cyanide sufficient to dissolve the zinc is then added, and the whole evaporated to dryness at a boiling temperature, a little more carbonate having first been added; on treating the dry mass with water the magnesia remains undissolved, and zinco-cyanide of potassium is held in solution.

3. *Zinc from Alumina.*—Excess of cyanide is added, heat being avoided; zinc is redissolved and alumina precipitated.

4. *Cobalt from Manganese.*—Their separation has been described by Liebig. [Phil. Mag. for April. *Vide* also Parnell's Elements of Chemical Analysis.]

5. *Cobalt from Lime, Baryta, and Strontia.*—The acid solution is mixed with excess of the cyanide, heated, and carbonate of potassa added, the whole boiled, and the cobalto-cyanide of potassium separated from the insoluble earthy carbonates by filtration.



6. *Cobalt from Alumina*.—The process is the same as that for separating zinc from alumina.

7. *Cobalt from Magnesia*.—The same as with zinc. Liebig has already stated that the cobalt may be quantitatively separated from the cobalto-percyanide by fusing it with nitre. The black residue of oxide of cobalt obtained on lixiviating the fused mass must be dissolved in an acid if desirous to operate accurately. From this solution it may be again precipitated by caustic potassa.

8. *Cobalt from Nickel*.—Has been pointed out by Liebig.

9. *Cobalt from Zinc*.—Cyanide of potassium is added until the precipitate, which is at first formed, is redissolved. The clear solution is mixed with excess of hydrochloric acid, by which a little cobalto-percyanide of zinc is precipitated. The solution contains chloride of zinc if excess of that metal was present, and cobalto-percyanide of potassium if there was more cobalt. The mixture is now boiled until the precipitate is entirely redissolved, and all hydrocyanic acid driven off. Caustic potassa is now added until the first-produced precipitate of cobalto-percyanide of zinc is redissolved, and sulphuretted hydrogen then passed through the solution. The zinc is precipitated, and pure cobalto-cyanide remains in solution.

It is therefore evident that by means of cyanide of potassium we are enabled to separate nickel, zinc and cobalt in a complete manner. The process at first is the same as that above described. After the addition of caustic potassa the whole is boiled until all ammonia has been expelled, and the precipitate now obtained is oxide of nickel containing zinc; the alkaline solution contains cobalto-cyanide of potassium and the greater part of the zinc; the filtered liquid is precipitated with sulphuretted hydrogen, by which zinc and cobalt are separated. The impure oxide of nickel is dissolved in acetic acid, and the zinc precipitated by sulphuretted hydrogen, and the precipitate added to the sulphuret of zinc first obtained. The oxide of nickel is precipitated by potassa.

10. *Nickel from Lime, Baryta, and Strontia*.—Cyanide of potassium is added in excess, and then carbonate of potassa; the whole is boiled, and the insoluble carbonate separated from the nicko-cyanide by filtration. The solution is boiled with hydrochloric acid until all hydrocyanic acid is expelled. Potassa in excess is added, and the whole boiled to expel ammonia, in which case the entire amount of the oxide of nickel is obtained.

11. *Nickel from Magnesia*.—The same as zinc from magnesia.

12. *Nickel from Alumina*.—Same as zinc from alumina.

13. *Lead from Cadmium*.—Excess of cyanide is added to the solution, and heat applied. The whole of the lead is separated as carbonate, free from cadmium; the precipitate must however be dissolved in nitric acid, and precipitated with oxalate or carbonate of ammonia, as it generally contains a little potash. The cadmium may be thrown down at once by sulphuretted hydrogen, or by carbonate of soda after the solution has been boiled with hydrochloric acid.



14. *Bismuth from Cadmium*.—Precisely the same as the foregoing.

15. *Copper from Bismuth*.—Same as the separation of cadmium from bismuth. The soluble cupro-cyanide is converted by long-continued boiling with acid into chloride of copper, and is then precipitated with potassa. The sulphurets of these metals may also be easily separated by means of the cyanide; that of copper is easily dissolved; sulphuret of bismuth remains unchanged.

16. *Copper from Lead*.—Same as above.

17. *Copper from Cadmium*.—Cyanide is added until a clear solution is obtained, and sulphuretted hydrogen is then passed through it; the cadmio-cyanide is completely decomposed, sulphuret of cadmium being thrown down, while the whole of the sulphuret of copper remains in solution, if the excess of sulphuretted hydrogen be driven off, and a little more alkaline cyanide added. The copper may then be determined by precipitating it as sulphuret by an acid, or by first decomposing the double cyanide and then boiling with potassa.

18. *Silver from Lead*.—By heating with cyanide of potassium, carbonate of lead is thrown down, and argento-cyanide remains in solution, from which the cyanide of silver is precipitated by nitric acid.

19. *Silver from Copper*.—Excess of cyanide is added until resolution is effected, and one of the following processes of separation employed: either the silver is precipitated by sulphuretted hydrogen, while the copper remains dissolved (see necessary precautions in 17), or the solution is mixed with nitric acid in excess, by which means cyanide of silver is fully precipitated.

20. *Silver from Cadmium*.—Nitric acid is added to the solution of the two double cyanides; cyanide of silver is precipitated; cyanide of cadmium is decomposed and retained in solution. Solution is boiled and carbonate of potassa added.

21. *Silver from Bismuth*.—Same process as for separating silver from lead. Silver may, it is true, be easily separated from bismuth, cadmium and copper by means of hydrochloric acid; but there are circumstances where the use of this reagent is objectionable, especially when lead is present, and in those cases the cyanide may be employed with great advantage.

22. *Mercury from Silver*.—The mercury, if present in the state of dinoxide, must always be peroxidized; cyanide is added till a clear solution is obtained; nitric acid is added, which throws down cyanide of silver, and cyanide of mercury is retained in solution, and may be decomposed and precipitated by sulphuretted hydrogen.

23. *Mercury from Copper*.—Exactly the same as cadmium from copper.

24. *Mercury from Lead*.—Cyanide is added and the whole heated. The lead is perfectly thrown down as carbonate.

25. *Mercury from Bismuth*.—As the above.

26. *Mercury from Cadmium*.—Very dilute nitric acid is added to the solution of the two double cyanides, and the whole boiled. The



salt of mercury is not decomposed, but the cadmium compound is converted into nitrate, and may consequently be decomposed by carbonate of potassa. The mercury is then thrown down as sulphuret.

27. *Platinum from Lead and Bismuth.*—Excess of cyanide is added; lead and bismuth are thrown down; platinum remains dissolved as a double cyanide. It is boiled with hydrochloric acid until all hydrocyanic acid is expelled; alcohol is then added, and the platinum precipitated by ammonia in the form of platino-chloride.

*Behaviour of Cyanide of Potassium to Oxides, Sulphurets, Salts, &c. in the Dry Way.*

Cyanide of potassium in a dry state can be employed in two manners:—

1. As a blowpipe reagent.
2. As a decomposing or reducing agent in crucible and tube operations. The authors made a great many experiments on these two points; those only are here mentioned which promise to be of utility or interest.

Sometimes pure cyanide was employed, at others a mixture of it with anhydrous carbonate of soda. This latter mixture was always employed in blowpipe experiments, because the pure salt is too easily fusible: its action is almost exactly like that of the simple carbonate. The advantages that it possesses are, first, the reductions take place with a facility that renders them easy of performance to the inexpert; and, secondly, the fused mixture does not enter into the charcoal so easily as common carbonate of soda, and consequently the grains of metal are more easily visible, and can be better examined.

Cyanide of potassium behaves in a peculiar manner to the nitrates and chlorates; when heated with them it causes a rapid decomposition, which is accompanied with evolution of light and with explosion, so that operating on large quantities is to be avoided. These salts, when in a dry state, may be readily discovered by mixing them with the cyanide, and heating the mixture on a piece of platinum foil; even if a very minute quantity is present an explosion is produced.

The use of the cyanide in reducing oxides and sulphurets of metals has been already pointed out by Professor Liebig.

According to the experiments of the authors it may be very advantageously used in the following cases:—

*Detection of Arsenic in Commercial Sulphuret of Antimony.*—When this sulphuret is heated before the blowpipe, the production of sulphurous acid hinders the recognition of the garlic-like smell of arsenic. It is the general custom to reduce the sulphuret by fusion with iron, charcoal, &c.; but this method is somewhat objectionable on account of the high temperature necessarily employed. If the sulphuret be pulverized and fused with  $\frac{3}{4}$  parts of the cyanide of potassium in a porcelain crucible over a spirit lamp, a regulus of antimony is obtained in a few minutes; this mass may then be tested



for arsenic, for on account of the low temperature employed none of this latter body can be volatilized.

*Formation of Metallic Mirrors from Compounds of Arsenic.*—The perfectly dry compound is placed in a tube with a bulb at one end, and about 6 times its weight of the dry mixture of cyanide and carbonate of soda shaken on to it. The bulb must not be filled more than half full; if this be neglected the fused cyanide sometimes rises into the tube. The reduction is caused by heating it with a spirit lamp. Beautiful rings were thus obtained from arsenious acid, sulphuret of arsenic, the arseniates of potassa, baryta, lime, silver, and arsenite of copper; imperfect ones, or none at all, were procured from the arseniates of lead and peroxide of iron. This use of the cyanide deserves particular attention on account of its facility of execution, accuracy and cleanliness.

*Decomposition of the Sulphates of the Alkaline Earths.*—These sulphates may be decomposed by fusion with cyanide of potassium, just as with carbonate of soda, but the heat required is much less, and may be performed in a porcelain crucible by the flame of a spirit lamp. In qualitative analyses this is of great use.

*Decomposition of Silicates.*—The cyanide acts just the same as the alkaline carbonates, but much less heat is necessary. For 1 part of the silicate it is advisable to take 5 parts of the mixture of cyanide of potassium and carbonate of soda.

*Separation of Compounds insoluble in Water and Acids from each other.*—In qualitative analyses, these bodies, as examples of which sulphates of baryta and lead and silicic acid may be mentioned, are often found very troublesome, inasmuch as it is scarcely possible to remove all the lead in the moist way, and the decomposition of the mixture by carbonate of soda requires a considerable heat. Carbonate of soda mixed with the cyanide will here be found very useful. When the three above salts are fused with from 4 to 5 parts of the mixture, the sulphate of lead is reduced, the sulphate of baryta becomes carbonate, and the silicic acid is taken up by the alkali. Water extracts the latter, and acetic acid removes the baryta and leaves metallic lead.

From the above experiments therefore it appears that cyanide of potassium may be reckoned as one of those reagents which are most useful to the analytical chemist.

#### *Solubility of the Sulphates of Lime and Strontia in Chloride of Sodium.*

Wackenroder found that sulphate of baryta is not at all dissolved by a solution of salt, while sulphate of strontia dissolves perfectly in it, although slowly. Dilute sulphuric acid precipitates the whole (?) of the strontia from this solution. Sulphate of lime dissolves readily in a solution of salt, but is not reprecipitated on the addition of dilute sulphuric acid.—*Ann. der Chem. und Pharm.*, xli.



## PHARMACOLOGY.

*On the Barks of Commerce.*

[Continued from page 44.]

IV. CINCHONA S. LUCIÆ seu PITON; *Saint Lucia Bark*; *China Piton*, Germ.

A NUMBER of experiments have been made by several chemists on this bark; the results, however, vary so much that there can scarcely be any doubt of the barks examined being distinct: it has moreover been proved that Pitoya Bark (*Cinchona bicolorata*) has frequently been mistaken for Piton. M. Winckler endeavoured for a long time in vain to procure a sample of this bark: once he obtained in its stead a very dark-coloured Huamalies bark, another time even *Cort. Hippocastani*; at last he succeeded in obtaining a sufficient quantity for examination from Messrs. Mueller and Stern, in Bern. It was discovered, with the name of *Cort. caribæus* attached to it, in an old collection of drugs. The specimens agree accurately with the description and drawing in Goebel's 'Pharmacology.' With regard to texture it resembles very much the *Cort. Geoffroyæ jamaicensis*, and may be separated like that into broad layers of liber; on the surface of some of the samples are even found the obtuse, warty prominences so characteristic of *Cort. Geoffr.* It differs decidedly from *Cort. caribæus*, which is closely allied to it, by the easy separation of the layers of liber. Sometimes, especially in the larger quills, a thick, corky, light-brown substance is met with, which is traversed by diagonal and horizontal furrows, peels off easily, and is very brittle; the surface beneath this has then the same appearance as those barks with smooth surface, only of lighter colour, it appears therefore as if this corky substance peeled off the tree of itself from time to time.

The most recent chemical examination of this bark is that of Caventou and Pelletier; they however have given but a very indifferent and unsatisfactory account of the principle which causes the excessive bitter taste of this bark, and which appeared therefore not uninteresting to inquire into.

To prepare this, 9 drachms of the fine powder of the bark were repeatedly extracted with alcohol of 0.863 sp. gr., the combined extracts filtered, and the dark brownish red tincture, which was coloured nearly black by a solution of the chloride of iron, shaken with pulverized oxide of lead to decolorize the tannin. The tincture was greatly decolorized by this process, but was still changed into a very beautiful grass green by solution of the perchloride of iron, without however any opakeness resulting. The yellow alcoholic solution left on evaporation 18 grs. of a pale yellow substance, which was immediately recognized as impure kinova bitter. It was dissolved in alcohol, and decolorized with animal charcoal, by which means the bitter principle was obtained pure. Not a trace of alkali could be detected.



*Reaction of the Extracts.*

*Decoct.*—While still warm, dark reddish brown, very transparent in thin layers, frothing strongly. When cold, slightly turbid, less transparent, of dark brown colour; sediment inconsiderable, dark reddish brown; taste, strong and disagreeably bitter, lasting for some time, not resembling bark, but rather like that of the extract of the false *Angustura* bark; smell, strongly of tan; filtrated by refracted light, almost untransparent dark reddish brown with a blue tint, at the surface slightly blue opalescent, by transmitted light nearly transparent, clear dark reddish brown. It reacts neither acid nor alkaline.

*Cold Extract.*—Dark brownish red with a bluish tinge; at the surface scarcely blue opalescent; taste, very strong and disagreeably bitter, of pretty considerable duration; smell, faintly of tan. The extract has neither acid nor alkaline reaction, and froths when shaken.

The experiments with the various tests have been arranged with those of the following bark:—

V. *CINCHONA NOVA FLAVA*; *New Yellow Bark*; *China nova flava*, Germ.

This bark is very little known, and generally occurs in commerce under the false name of *Cinchona flava dura*. In the year 1819 a quantity made its way into Thuringia from Bremen as *Cortex caribæus*, and was offered for sale at a very low price; it was used in intermittent fevers as a substitute for cinchona. Winckler has chosen the name of *Cinchona nova flava* for it, since it contains not a trace of any alkali, but only kinova bitter, and is most similar in its physical characters, with the exception of the colour, to *Cinchona nova surinamensis*.

M. Winckler also obtained this bark under the name of *Cinchona flava dura*, in strong flat, or more or less curved, rarely half-quilled pieces. The colour of the bark, especially when seen in masses, inclines, compared with that of *Cinchona Calisava seu regia*, remarkably to brown. On some pieces are found furrows varying in depth and in breadth, and which appear to have been made with some instrument.

400 gr. of the bark afforded 7 gr. of pure kinova bitter; 170 gr. bark of the second parcel, 2 gr. of this substance.

*Reaction of the Extracts.*

*Decoct.*—The liquid, while warm, pretty clear, dark red brown; when cold, no turbidness. Sediment inconsiderable, dark reddish brown, not voluminous. Taste, bitter, but not of long duration. Smell of the boiling mixture, strongly of tan, of the cold extract scarcely perceptible. The filtered liquid is clear, dark reddish brown, and froths when shaken.

*Cold Extract.*—The liquid nearly as dark as the decoct, reddish brown; taste, bitter, not of duration; smell, stronger of tan than that of the cold decoct; froths on being shaken.



*Experiments with the Infusions of Cinchona Piton and Cinchona nova flava.*

DECOCTS.						
	<i>Gelatine.</i>	<i>Tincture of Galls.</i>	<i>Perchloride of Iron.</i>	<i>Emetic Tartar.</i>	<i>Oxalate of Ammonia.</i>	<i>Iodic Acid.</i>
Cinch. Piton. After preparation.	Immediately a large dark brownish yellow precipitate.	Considerable dirty light yellowish brown turbidness, colour of liquid grayish.	Very dark greenish brown turbidn., white precipitate, which soon disappears.	No effect, soon a scarcely perceptible turbidness.	Slight turbidness, and small pulverulent crystalline precipitate.	Very strong dirty light yellowish brown turbidness.
After 24 hours.	Somewhat large dark reddish brown flocc. precip., liq. clear, brownish yellow.	At first strongly turbid, from a white pulverulent precip., liq. of a light grayish yellow.	Large dirty dark green flocculent precipitate, a liquid opaque, blackish green.	As above.	As above.	Large flocc. light yellowish brown precipitate, liquid clear, light brownish yellow.
Cinch. nova flava. After prep.	As in extract, precip. more considerable.	No change, soon a slight turbidness.	Black colouring, shading into greenish brown.	Slight turbidness.	Turbidness stronger than in extract.	Precipitate larger than in extract.
After 24 hours.	Voluminous yellowish brown flocculent precipitate, liquid clear.	Unchanged.	As above.	Slight gray precipitate.	As in extract.	As in extract, precipitate darker.
EXTRACTS.						
Cinch. Piton. After prep.	Light brownish yellow turbidness.	Considerable brownish yellow turbidn., liquid faint blue opalescence.	Dark greenish brown colouring, no gray precipitate.	No perceptible change.	No change.	Slight yellowish turbidness.
After 24 hours.	Dark reddish brown precip., less than in decoct; liq. clear, deep wine yellow.	As above, but with a slight precipitate of light brownish yellow colour.	Large dirty dark green flocculent precip., liq. almost transparent, blackish green.	As above.	Slight pulverulent pale bluish green precipitate, liquid clear, deep brownish yellow.	Large flocculent yellowish brown precipitate, liq. deep brownish yellow.
Cinch. nova flava. After prep.	Turbidness, and soon a yellowish brown flocculent precipitate.	No change.	Dark green colouring.	No change.	Slight yellowish brown turbidness becoming stronger.	Considerable yell. br. turbidn., and soon a large flocc. precipitate.
After 24 hours.	Voluminous yellowish brown precipitate.	As after preparation.	As after preparation.	As after preparation.	Slight pulv. dirty white precipitate, liq. clear, yellowish brown.	Pale yell. brown large flocc. precip., liq. clear, with smell of iodine.



*Observations on Copaiva Balsam.* By M. VIGNE.

Copaiva balsam is derived from Columbia, Brazil, Peru, Cayenne, and the Antilles. None appears to come from Mexico. The best is that imported from Maracaibo and St. Martha, which is packed in oak casks containing from 1 to  $1\frac{1}{2}$  cwt., in large bottles, or in cylindrical tin boxes. The boxes contain about 6 kilogrammes, are closed at both ends by flat soldered lids, and the one lid has an aperture in the centre, which is closed by a square piece of tin-plate soldered on. This mode of packing renders all adulterations very difficult (excepting naturally such additions as are made when it is collected, for instance chalk, to saturate the free acid), but the balsam seems to change very much in these boxes. The author examined samples from 12 boxes obtained at the same time and from the same locality; but not one agreed with the other, not one was entirely soluble in alcohol, and smell, taste and consistence were different in all. In those boxes from which the balsam flowed out *clear* crystals were deposited, which were obtained perfectly white by means of bibulous paper; but no such sediment was found in the opaque balsam; this did not clarify even on being left to stand, but when kept in a moderately warm place deposited a resinous substance quite distinct from the crystals. The clear balsam dissolved nearly wholly in alcohol, the opaque always less, sometimes scarcely at all. The most opaque and least soluble in alcohol did not even clarify on being treated with ammonia, while all the others formed with it a clear solution. The crystallized resin dissolved abundantly in hot alcohol, but separated almost entirely on cooling: the solution had an acid reaction; while, on the other hand, neither the balsam nor the resin which had separated from it possessed acid properties.

The author further examined 12 different samples from St. Martha, which had been imported in oak casks. They were likewise all different, although in general more transparent and thicker than the former. The following experiments were made with the best, perfectly transparent, amber yellow, aromatic smelling, samples of the consistence of turpentine.

With  $\frac{1}{20}$  *magnesia usta* it became in 24 hours like a thick gum slime; after 48 hours it was considerably thicker, and subsequently acquired a good pill consistence. It did not dissolve in an equal part of alcohol of 0.914, but afforded a milky mixture, which soon separated into two layers, of which the upper one contained but a little copaiva. Alcohol of 0.900 dissolved it in every proportion at 59° F. A mixture of  $2\frac{1}{2}$  balsam and 1 ammonia soon became transparent, and might be heated to 212° Fahr. for half an hour without any change taking place. On boiling it with 50 times its weight of water the balsam lost half its weight in æthereal oil. With caustic potash it afforded a kind of emulsion, upon which the saponified balsam soon swam.

Only one of the other samples gave a good mass for pills with  $\frac{1}{20}$  *magnesia*; two became somewhat more consistent, but not suffi-



ciently so ; three became thick at first, but subsequently liquid again ; and four did not change at all, but deposited the magnesia. The second sample afforded with ammonia a clear constant compound ; with the two next the combination was less constant ; the fifth and sixth only became clear after some time ; the others remained opake. Not one sample dissolved entirely in alcohol of sp. gr. 0·914 ; the more pure in every proportion in alcohol of 0·900 ; the last sample, even with this, separated into two layers. The loss in æthereal oil was about the same in all the samples, but the last lost 70 per cent. instead of 50. It is evident therefore that the power of dissolving in alcohol, of becoming consistent with magnesia, and of entering into a constant combination with ammonia, are nearly parallel ; but these properties evidently depend on the amount of acid resin, and the thicker balsams therefore exhibit them in a greater degree.

The last sample, which had a very agreeable smell, and was very liquid, nearly colourless, perfectly transparent, and stated to be from Para, contained evidently more æthereal oil and less resin than the others, and on account of its imperfect solubility in alcohol was considered to have been adulterated with a fat oil ; but the residue from the distillation was dry, and that was consequently out of the question. When kept for a long time in a badly stoppered bottle it became gradually coloured, and more soluble in ammonia and in alcohol, evidently from more of the oil being converted into resin.

The author further examined two samples of balsam from Para, which were considered to have been purposely adulterated with rancid oil of almonds. They dissolved well in alcohol, but combined badly with magnesia and ammonia. Direct experiments showed that pure copaiva balsam may be adulterated with 50 per cent. of a fat oil (nut oil, almond oil), without its ceasing to give a clear solution in 2 parts alcohol. Only after from 12 to 15 hours does the oil separate. Excess of alcohol separates the oil in all cases. It is evident therefore that under certain circumstances an unadulterated balsam may be insoluble or of difficult solution in alcohol ; an adulterated one, on the contrary, may be soluble. The best test for detecting the fat oils would be alcohol to which some caustic potash has been added.—*Journ. de Pharm.*, 1842, p. 52.

#### *Test for the Adulteration of Æthereal Oils with Alcohol.*

The best method of testing, according to Borsarelli, is with chloride of calcium. Perfectly dry chloride of calcium dissolves in oils containing alcohol, and forms a liquid stratum at the bottom of the vessel ; when but little alcohol has been mixed with them, the pieces change, at least their form, but in pure oils the chloride of calcium remains perfectly unaltered. This has been confirmed by Brandes on oil of lemons.—*Archiv der Pharm.*, xxiv. p. 113.



## CHEMICAL PREPARATIONS.

*On the different Methods of preparing Iodide of Potassium.*

THIS preparation, which is at present so extensively used in medicine, has been prepared after a great variety of methods. Capaun undertook a series of experiments to determine which was the best, and which would produce from 4 oz. iodine the greatest possible quantity of pure iodide of potassium, viz. 5 oz. 1 dr. 55 grs. The solutions were not allowed to crystallize, but were evaporated to dryness. In those methods in which hydriodic acid is employed, an acid of a determinate strength was prepared according to Brandes, by bringing together sulphuretted hydrogen and vapours of iodine; by this means the normal quantity of 4 oz. of iodine could always be employed.

*Saturation of Hydriodic Acid by Caustic or Carbonated Potassa.*—The product amounted to 4 oz. 7 dr. 20 grs., after the silica usually contained in the potassa had been separated by filtration. This method is not advantageous on account of the preparation of the hydriodic acid.

*Treatment of Iodine with Potassa and Water.*—Brandes heated 4 oz. of iodine with 2 oz. of potassa and 8 of water in a retort, but the whole of the iodine could not be dissolved even when 2 drachms of caustic alkali had been added; 4 oz. 3 dr. were employed before a clear solution was obtained. The solution was quickly evaporated to dryness, and heated so as to decompose the iodate, the retort broken, the mass, which weighed 7 oz. 1 dr., dissolved in water, and the potassa saturated with an excess of hydriodic acid equivalent to 2 oz. 2 dr. of iodine. On evaporation, 6 oz. 5 dr. iodide of potassium were obtained, or 4 oz. iodine produced 4 oz. 1 dr. 55 grs.

The usual quantity of 4 oz. of iodine was heated with 4 oz. 3 dr. caustic potassa and 12 oz. water until the brown colour disappeared. The whole was then evaporated to dryness and extracted with 12 oz. of alcohol (0.845) in succession. The insoluble portion was dissolved in water, neutralized with hydriodic acid, the alcoholic solution distilled, the residue dissolved and neutralized, &c. In this manner 4 oz. iodine yielded 4 oz. 1 dr. 33 grs. very beautiful iodide of potassium.

*According to the Pharm. Borussica.*—Carbonate of potash is rendered caustic by the usual process, and the solution evaporated to a density of 1.19.

Of this, 6 oz., heated to 112° Fahr. in a porcelain dish, were gradually mixed with 4 oz. of iodine. The fluid was dark reddish brown, but was rendered colourless on the addition of a few drachms of caustic potassa without becoming alkaline. If the potash lye contain carbonate, now is the period for neutralizing it. The solution must be evaporated till a pellicle forms, and the iodate allowed to crystallize out during the night, as Berzelius has recommended; it is then washed with water, and heated by itself.

The solution was evaporated and the residue heated with the



necessary precautions, until no more oxygen was evolved and the mass perfectly fused. More than a quarter of an hour, as stated by the Pharm. Bor., is necessary for this operation. Capaun prefers employing a glass flask to fusing it in an iron vessel and pouring it out on to an iron plate, as recommended by Duflos; for it sometimes contains excess of iodine, and is then rendered impure by iron. The quantity obtained was 5 oz. 20 grs., which agrees very nearly with theory. It is, however, scarcely possible to avoid the salt's containing some iodate, and if too much heat be employed, there is a loss of iodine.

*According to Turner.*—The process is the same as the preceding at first. The neutral solution (which may contain iodine but no excess of potassa) is diluted with 3 times its weight of water, and sulphuretted hydrogen passed through it until an excess of gas is present. The sulphur is separated by filtration, washed, and the solution evaporated, after having been boiled for a short time. The quantity obtained was 4 oz. 4 dr. 24 grs. The objection to this method is, that a large quantity of fluid has to be evaporated and less salt is obtained; but to counteract this, the product is very pure, it is not necessary to heat the residue, and a small quantity of carbonate in the lye has no injurious effect.

*Preparation of Iodide of Potassium by Double Decomposition.*

*Hermann's Method.*—4 ounces of iodine were triturated with a thick milk of lime until the mass acquired a light colour. As it was evident that iodate of lime must have been formed, Capaun dried and heated it; it was then extracted with water, and the filtered solution precipitated with carbonate of potassa, the excess of alkali neutralized with hydriodic acid, and the solution evaporated. The quantity was 4 oz. 3 drs. Hermann, who neglected the iodate of lime, must have obtained still less.

*Baup's Method.*—2 oz. of iron filings were mixed with 1 lb. of water, and 4 oz. of iodine gradually added, so that the temperature never rose above 104° Fahr. All the iron was taken up and a clear solution obtained by filtration, which was mixed with 6 lbs. of distilled water, heated to boiling, and decomposed by a solution of 1 part of carbonate of potassa in 6 of water, as long as a precipitate was formed. About  $2\frac{1}{2}$  oz. of carbonate are required. The mixture was rapidly filtered, the solution neutralized with hydriodic acid and evaporated. The quantity of salt obtained from 4 oz. of iodine was 4 oz. 3 drs. It is necessary to employ pure iron, and to keep the temperature low, if this method is to succeed. Caillot's improvements appear unnecessary.

*Winckler's Method.*—4 oz. iron filings, 4 oz. iodine, and 2 lbs. water were mixed as above, the solution precipitated with carbonate of potassa, filtered, but not neutralized with hydriodic acid, evaporated to dryness, and the mass extracted with alcohol of sp. gr. 0.8631 as long as iodide of potassium was taken up. 4 lbs. of alcohol were used. The alcoholic solution was then distilled, the salt fused in a Hessian crucible and poured out on to a marble slab, again dissolved



in water, filtered and evaporated. The product was only 3 oz. 6 drs. 17 grs. Winckler himself did not obtain more than 4 oz.

*Duflos' Method.*—4 oz. of iodine were mixed with 4 oz. of granulated zinc and 8 oz. of water, and allowed to stand. When no more action was apparent the mixture was warmed until the solution became colourless. It was then filtered, the residueedulcorated, the solution heated to boiling, and precipitated by means of carbonate of potassa. An excess of this salt is necessary in order to throw down all the zinc. The filtered solution was neutralized with hydriodic acid, treated with sulphuretted hydrogen for the sake of security, and evaporated. The product was 5 oz. 17 grs. This method deserves particular attention. The carbonate of zinc may be employed in making chloride or oxide of zinc. No loss of iodine occurs from heat or from the oxidation of the metal, as in Baup's method.

*Serullas' Method.*—4 oz. of pulverized antimony, 4 oz. iodine, and 1 lb. water were warmed together. The filtered solution was boiled with an excess of carbonate of potassa (2 oz.). The solution, when poured off, left oxide of antimony, but not so free from iodine as to admit of its being used for tartar emetic, &c. Only 3 oz. 7 drs. 25 grs. were thus obtained.

#### *Preparation by means of an Alcoholic Tincture of Iodine.*

*Dumenil's Method.*—This method differs from the first only in the employment of alcohol. The use of alcohol is attended with expense, and, from its decomposition by potassa, often renders the product impure. A solution of 4 oz. iodine in 4 lbs. alcohol of 0.8631 was converted into hydriodic acid by means of sulphuretted hydrogen, and filtered off from the sulphur; 3 oz. of potassa were dissolved in 1 lb. of alcohol so as to obtain as colourless a solution as possible, the solutions were mixed until neutralization ensued, the alcohol distilled off, &c. 4 oz. 2 drs. 4 grs. of yellow iodide were obtained, which was decolorized by charcoal, but even then retained an unpleasant smell.

*Taddei's Method.*—A solution of 4 oz. of iodine in 4 lbs. alcohol of 0.8631 was gradually mixed with a solution of 6 oz. of sulphuret of potassium in 3 lbs. of alcohol, the precipitated sulphur separated by filtration, and the solution evaporated. Very white iodide was obtained to the amount of 4 oz. 10 grs. An excess of sulphuret may be removed by an addition of iodine.

*Geiger's Method.*—6 oz. of liver of sulphur were dissolved in 3 lbs. of alcohol, and 4 oz. of iodine added, the whole being agitated to effect neutralization, and a part of the solution of sulphuret being kept back in case of too much iodine being added. The sulphur was filtered off, the alcohol distilled, and the residue evaporated. The product amounted to 4 oz. 6 drs. 15 grs.

According to the quantities obtained from 4 oz. of iodine, the methods may be arranged as follows:—



	oz.	dr.	gr.	
1. Method of the Pharm. Boruss...	5	0	20	Product not free from iodate.
2. ——— Duflos .....	5	0	17	Deserves attention.
3. Direct Method, 1. ....	4	7	20	Practically inconvenient.
4. Method of Geiger.....	4	6	15	{ Dear on account of the alcohol, and inconvenient on the large scale.
5. ——— Turner.....	4	4	24	
6. ——— Baup .....	4	3	0	{ Easy of execution. Product very good.
7. ——— Dumenil .....	4	2	4	
8. ——— Brandes (a.) .....	4	1	55	
9. ——— (b.) .....	4	1	33	
10. ——— Hermann.....	4	0	28	
11. ——— Taddei.....	4	0	10	
12. ——— Serullas .....	3	7	25	
13. ——— Winckler.....	3	6	17	

*Archiv der Pharm.*, xxxi. p. 36.

It is evident, that, to the English manufacturer, all the methods which require the use of alcohol are perfectly useless. The process of Turner or that of Duflos appears to be the best of all. In reference to the latter we would refer the reader to a paper on basic iodide of zinc by Müller in our last Number. In the 29th vol. of the 'Archiv der Pharmacie,' Otto Eger has also published a long paper on the same subject. He arrived at nearly the same results as Capaun, but he prefers the method of Turner to that of Duflos, on account of the difficulty of perfectly washing out the carbonate of zinc. He also praises the method with lime, if, as he proposes, the iodate be first reduced by means of sulphuretted hydrogen.

#### *Finely divided Tartar Emetic.*

This is prepared, according to M. Hoffmann, in the following manner:—6 oz. of tartar emetic are dissolved in 32 oz. *boiling* water, and the solution precipitated with 64 oz. alcohol. The loss in tartar emetic does not amount to more than half a drachm, and the alcohol is re-obtained by distillation.—*Jahrbuch für Prakt. Pharm.*

#### *Quesneville's Ferruginous Effervescing Powders.*

Under the name of "*poudre pour eau gazeuse ferrée*," Quesneville sells a powder, of which 16 grammes are placed in a vessel full of water, which is then well corked until the whole has dissolved. It may be taken as a chalybeate. Quesneville states the powder to consist of 4 drachms sugar, 1 dr. bicitrate of soda, 18 grs. bicarbonate of soda, and 18 grs. double citrate of iron and soda. Breton found it impossible to obtain the latter double salt in a fit state for pulverization, and therefore submitted the powder to a more careful examination. He attempted to separate the constituents mechanically, and in this way obtained colourless acid grains, which proved to be tartaric acid, particles of bicarbonate of soda, and a small quantity of transparent pale green granules, which proved to be the protosulphate of iron. In a quantitative analysis, in which the tartaric acid was determined as a lead salt, the iron as oxide, the soda



as sulphate, and the loss accounted for as sugar, Breton found Quesneville's powder to consist of 20 parts bicarbonate of soda,  $22\frac{1}{2}$  tart. acid, 1 part green vitriol, and  $56\frac{1}{2}$  sugar; there is therefore an excess of tartaric acid. Water prepared with the powder made according to the above prescription, had quite the taste of Quesneville's. The bicarbonate of soda and the tartaric acid must not be powdered finely, otherwise they act on each other even in the state of powder.—*Journ. de Pharm.*

#### *Preparation of Tinctura ferri acetici ætherea.*

According to Pagenstecher, 18 parts of acetate of potash are dissolved in 28 parts alcohol of sp. gr. 0.908, diluted with 6 parts water; when the whole has dissolved, 17 parts of perfectly dry persulphate of iron are added, and it is then digested for 3 days, being frequently stirred; it is then brought on to a filter, pressed well, and the clear solution mixed with  $\frac{1}{5}$ th its weight of rectified acetic æther. The method is of easy execution, and affords a preparation which always contains the same amount of iron.—*Buch. Rept.*, xxiii. p. 38.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the Preparation of Carbonate of Barytes, and its Use in the Fabrication of Soda.* By M. WEISS.

OF all the methods proposed for decomposing heavy spar, the two following are the cheapest and most perfect:—

1. Heating the pulverized heavy spar with  $\frac{1}{8}$ th charcoal powder and  $\frac{1}{4}$ th wheaten flour or colophonium in covered crucibles, and heating again the powdered product formed into balls with  $\frac{1}{3}$ th charcoal and water, and placed between layers of charcoal. The brownish gray mass which is obtained affords with hot water a solution from which the sulphuret of barium easily crystallizes. The sulphur is best removed from this solution after the method of Vogel, by continued boiling with a mixture of the oxide and dinoxide of copper, and the solution then contains caustic barytes. In preparing the chloride of barium an excess of hydrochloric acid must be carefully avoided, and the crystals cleansed by washing and recrystallization.

2. Fusing 2 parts heavy spar with 1 of chloride of calcium (Driessen) or 4 heavy spar, 3 chloride of calcium and 1 dust of iron filings (Duflos) in covered crucibles; the cold and powdered mass is then extracted with hot water, the mother ley exposed to the atmosphere, filtered, and the chloride of barium left to crystallize.

The solution of caustic barytes may be very advantageously employed in preparing caustic potash or caustic soda from their sulphates. The preparation of the carbonate of barytes may be from the chloride of barium by means of carbonate of ammonia, when sal-ammoniac is obtained as a collateral product, or by means of



carbonate of lime. The last method is of importance in the manufacture of soda from the sulphate of soda and carbonate of barytes, according to Kœlreuter. The author convinced himself that heavy spar might be decomposed even in the cold by triturating with carbonate of lime and water. An experiment made with 122 grs. heavy spar and 50 grs. carbonate of lime and 2 oz. water, only afforded 5.7 grs. carbonate of barytes; but if water impregnated with carbonic acid (8 oz.) was employed instead of pure water, and the whole left to stand (being frequently shaken) for 14 days, 32 gr. carbonate of barytes were obtained. 98 grs. should have been obtained according to theory, and this complete decomposition would probably be attained at low temperatures.

The author attempted, under similar conditions, *i. e.* cotemporaneous use of carbonate of lime, carbonated water, and low temperature, to decompose the sulphate of barytes direct. He succeeded in obtaining small quantities of carbonate of barytes, but only when the salts were finely divided and by continued trituration; he obtained most in one experiment with freshly precipitated carbonate of lime and lævigated powder of heavy spar at from 5° to 0° Fahr., in which about  $\frac{1}{6}$ th of the heavy spar was decomposed.—*Arch. der Pharm.*, p. 80.

#### *On the Preparation of Caoutchouc.*

Mr. Solly has published a paper on the preparation of caoutchouc. He adverts to the manner in which the sap is prepared for the market, being laid on to any substance in successive layers, which are allowed to dry. That such is the case is rendered evident by cutting a bottle of caoutchouc; the layers are distinctly visible, and they may even be separated if the mass be soaked in boiling water. It is evident that a great quantity of impurities must be deposited on the surface, and thus diminish the force with which the layers adhere to each other, thereby taking away considerably from the value of the substance. In large masses of fresh caoutchouc a great number of cavities filled with a brown liquid may be discovered, and these of course diminish its strength. Mr. Solly has made a few experiments on this subject, and proposes that the sap as first procured should be washed with water. The sap which separates may then be pressed, and will be found infinitely stronger than that prepared without the washing.—*Transactions of the Asiatic Society of London.*

## PROCEEDINGS OF THE CHEMICAL SOCIETY OF LONDON.

*Nov. 1st.*—(W. J. Brande, Esq., V.P., in the Chair.) Read, a paper by Prof. Graham, "On Heat of Combinations: Part I., Heat evolved in the hydration of oil of vitriol, and other magnesian sulphates." The apparatus employed was exhibited. It consisted simply of a large platinum crucible, a stirrer, and a delicate mercurial thermometer of very small bulb. The quantity of water used



was constant, namely, 1000 grains, and relatively large, so as to render the change of the specific heat of the fluid insensible. The results are therefore comparative, and express relative quantities of heat.

The heat evolved by each atom of water successively, added to the concentrated oil of vitriol, or the simple sulphate of water, is expressed in a table; 30·68 grains of oil of vitriol being the quantity diffused through 1000 grains of water. From the results the author infers, that after the formation of hydrate of water  $\text{HO}, \text{SO}_3 + \text{HO}$  (the crystallizable acid of sp. gr. 1·78), the hydration advances by 2 atoms at a time. Acid containing already 50 atoms of water still gives out 0·10 degree by further dilution. On full hydration and solution of the following sulphates, taken in equivalent quantities, the heat evolved is as follows:—

Sulphate of copper	.....	3°·74
... .. water	.....	3°·86
... .. zinc	.....	4°·20
... .. magnesia	.....	4°·36.

The degree of cold from the solution of the crystallized salts was likewise ascertained; as also the heat of different hydrates of the same salts, and of their double salts.

A paper, by Dr. J. Stenhouse, "On Pyrogallic Acid, and some of the Astringent Matters which yield it." After detailing the usual method of obtaining this acid, and the objections to which it is liable, the author described the process which he found most advantageous for its preparation, which consists in dissolving out by cold water the soluble matter contained in gall-nuts. The solution is evaporated to perfect dryness, and the residue subjected to sublimation at 400° Fahr., in an apparatus similar to that employed for benzoic acid.

The acid as thus obtained, is in the form of perfectly white needles or large scales; it has a bitter taste, does not redden litmus paper, colours solutions of protosulphate of iron a deep indigo blue, and persulphate yellow or red, but no precipitation occurs; when dropped into milk of lime, a beautiful reddish purple colour is produced, which changes to a dark brown, and then becomes black.

By analysis it was found to consist of 8 C, 4 H, 4 O. Obtained in crystals from its solution in water, it had the same composition, and not that of a hydrate.

Its atomic weight, as obtained from the analysis of the lead salt, is 1044; its formula is therefore  $\text{C}^8 \text{H}^4 \text{O}^4$ , and not  $\text{C}^6 \text{H}^3 \text{O}^3$ , as given by Berzelius. It does not combine with the alkalies, but becomes of a brown colour from the absorption of oxygen. Campbell, when working in Liebig's laboratory, obtained the same formula for this acid. The details of his experiments have however not been published.

A paper by Mr. G. Fownes, "On the Analysis of Organic Substances containing Nitrogen." The circumstance which led to the present note on the analysis of azotized organic bodies, the author states, was an attack lately made by M. Reiset on the new method



of determining the nitrogen in such cases, put into practice with great apparent success by MM. Will and Varrentrapp of Giessen. It is stated by M. Reiset, that when sugar is burnt, with the usual mixture of hydrate of soda and lime, in fine powder, and the gases evolved conducted into hydrochloric acid, an addition of pure chloride of platinum, and evaporation to dryness, gives rise to a quantity of the double chloride of platinum and ammonium, indicating in some experiments 1 to 1.5 per cent. of nitrogen in the body analysed; and as this was considered too great to be attributed to accidental impurity, it was ascribed to the absorption of the nitrogen of the air contained in the tube by the mixture of carbonaceous matter and alkali, and the subsequent conversion of the cyanide so formed into ammonia; and this idea was strengthened by repeating the experiment with the tube filled with hydrogen instead of air, when the production of ammonia was found to be lessened. According to Mr. Fownes, when the finest sugar-candy was thus burnt, a certain quantity of the yellow platinum salt always remained upon the filter after washing with the mixture of alcohol and æther; but this quantity, instead of indicating 1 per cent. or more of nitrogen, gave in three experiments only .06 per cent.,—a quantity attributable to impurity. Tartaric acid and charcoal made from white sugar gave similar results; the ammonia amounting to a mere trace, doubtless due to foreign admixture. Hence it is inferred that the material used by the objector to the process was impure.

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## REVIEWS.

*Turner's Elements of Chemistry.* 7th edition. Edited by W. GREGORY and JUSTUS LIEBIG. Taylor and Walton.

THERE is no English work on chemistry which has been in so many hands and has met with such universal approbation as 'Turner's Elements,' and there is scarcely any work which has received so many additions and improvements in passing through its numerous editions. The present one appears to fulfill all that can be desired of a work of this kind. In the former editions, which were conducted by the late lamented Dr. Turner, the inorganic division of the subject was treated with that clearness, perspicuity and beauty of arrangement so peculiarly his own; but the organic part of the work, although giving a very good general outline of this part of chemistry, was not so full as could be wished, when the almost miraculous advances of this interesting branch of the science were taken into consideration. The edition now before us, by W. Gregory and J. Liebig, leaves nothing to be desired in this respect; they have rendered it exceedingly complete, carrying out at the same time the original idea of Turner. There are many other new works on chemistry of surpassing merit, but some of them are more adapted to the teacher than the student; some are based on entirely new hypotheses, adopted only by a few, and consequently, although of incalculable value to advanced students, do not render such eminent



service to young chemists as works on the usual plan are capable of doing. Of these latter the work before us is a splendid example; and as a compendium of the present state of chemistry, and a text book for all beginners, we consider it as unequalled by any in the English language, and we even doubt whether there are any of the foreign manuals of an equal size which can venture to compete with it. There are some points of course to which objections may be raised; the names of some substances, as applied to them by their discoverers, have been altered, and the enormous confusion of nomenclature unnecessarily increased. There is no need for giving the name of *sulpho-hydramide* to a body which Rose had called so properly *sulphate of ammon*. This point, as also the scantiness of the index, are faults which it would be well to alter. A good index is of the greatest advantage, while in the one before us we look in vain for pectic, metapectic acids, sulphate of ammon, mecono-nitric acid, &c. The value of the work would have been considerably increased if the index had been made somewhat similar to that annexed to Brande's 'Manual of Chemistry:' although the different bodies are arranged under particular heads, still looking for them without the help of a register occupies a considerable time.

*The Pocket Formulary, and Synopsis of the British and Foreign Pharmacopœias.* By HENRY BEASLEY. Second Edition. London: Sherwood, Gilbert and Piper.

This work contains a collection of about fifteen hundred formulæ, according to the London, Edinburgh, Dublin, United States, and most continental pharmacopœias, and is intended as a convenient book of reference for the dispensing chemist, the student and the medical practitioner. The comparison of the prescriptions of the different pharmacopœias, which is rendered possible by this book, is extremely interesting; and to those for whom it is intended the publication promises to be useful.

*Gas Meters: their Unfairness demonstrated.* By H. FLOWER. London: G. Mann.

This pamphlet has been written for the purpose of directing the attention of the public to the impositions sometimes practised by the gas companies with regard to the quantity of gas registered by the meters. Mr. Flower seems to have proved that the meters erected in private houses frequently register 1000 cubic feet, while they have in fact only given 900, sometimes indeed only 600 or 700. Mr. Flower points out the cause of this false registration, and gives a plan both for correcting the defect and for ascertaining its amount. The publication is of the very greatest importance to all those who may have meters on their establishments. A few words are also added explanatory of the processes for purifying and naphthalizing coal-gas.



*The Literary and Scientific Register and Almanac for 1843.* By T. W. G. Gutch. London: Edward Lumley.

The present season is generally productive of a variety of works reminding us of the close of the year. Among these the almanacs occupy a conspicuous place, and we have now, in this enlightened era, almanacs for the mechanic, for the farmer, for the physician, &c., and to Mr. Gutch we are indebted for an almanac for the scientific man. To the class of persons to whom the pages of this Journal are addressed, this neat little book will be found a peculiarly valuable companion; and, to prove our assertion, we shall, without detailing the numerous and varied contents, just notice some of those chapters which come more within our own department. Under each month is given a list of the rarer plants which are then to be met with. Among the chemical articles is a chapter on the tests for the metals, alkalies, earths and acids; also Hartwig's experiments on the limits of the sensibility of many reagents; the atomic weights, not only of the elements but of their various oxides, and many of the salts of most common occurrence in commerce. In another chapter we have a number of useful recipes, miscellaneous, medical and veterinary. There is also one on photography, and the various methods of preparing the different kinds of sensitive papers; and moreover a number of useful tables of specific gravities, of the strength of iron, of the affinities of acids for bases, weights and measures of various countries, &c., the mere enumeration of which would occupy more space than can be allowed in this Journal. We can recommend it strongly to our readers as being the most useful of the works of its kind, and containing most information connected with their pursuits.

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## PATENTS.

*Patent granted to Edmund Morewood, of Highgate, Middlesex, for an Improved Mode of preserving Iron and other Metals from Oxidation or Rust.*

I CLAIM the preserving of iron and other metals capable of being tinned, and fusing at a temperature of not less than 1200° of Fahrenheit from oxidation, by tinning them and then dipping the tin covering or surface in molten zinc, or coating the tin covering or surface with zinc in such manner that a union or contact shall take place between the surfaces of the zinc and tin, so that a united or combined influence is exerted in the preservation of the metal, the zinc preventing the destructive influence of the tin upon the iron or other metal when tin alone is used, and the tin lessening the destructive influence of the iron or other metal.—Sealed Aug. 1841.



# THE CHEMICAL GAZETTE.

No. IV.—Dec. 15, 1842.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

### *On Lithofellinic Acid.*

THIS acid, which constitutes the greater portion of the so-called Bezoars, a kind of gall-stone formerly highly prized in Europe, and even at the present day much valued in some parts of Asia, was first noticed by M. Göbel in examining a shaly gall-stone preserved in the Zoological Museum of Dorpat. A portion of the acid was analysed by MM. Ettling and Will, who found it to consist of carbon 71.19, hydrogen 10.85, and oxygen 17.96. It has recently been observed by Prof. Wöhler in a concretion among a collection of pathological products at Göttingen, but unfortunately without any notice respecting its origin; from its colour however it was evidently a gall-stone, and most probably from some large exotic animal. It weighed 40 grammes, had an ovate form, and was of a brownish green colour, with a waxy lustre. It consisted of a large number of thin, easily separable layers, of alternate darker and lighter colour, without a trace of crystalline structure. It inclosed a kind of longish nucleus,—a thick brown substance, which behaved towards reagents as the remainder of the stone, with the exception that it was only semi-fusible, and left on ignition a yellowish ash, of alkaline properties, which contained phosphate and carbonate of lime with traces of the peroxide of iron. The mass of the stone fused very easily, like wax, giving off white slightly aromatic vapours, devoid of any empyreumatic smell, and burnt with a lucent flame with scarcely any residue. It was perfectly soluble in hot alcohol, with the exception of a small brown residue; the solution was of a greenish colour, and deposited very slowly on cooling the dissolved substance in crystalline crusts. The lithofellinic acid was obtained perfectly colourless by re-solution in alcohol and digesting with animal charcoal. It formed, with the exception of the small quantity of colouring matter, the entire mass of the stone.

The crystals of lithofellinic acid are always very small; under the microscope they appear to be six-sided prisms, with plane terminal surfaces. They are hard, easily pulverized, insoluble in water, soluble but very slowly in alcohol, from which they are as slowly deposited. The solution has an acid action. In æther this acid is very sparingly soluble; it melts at 401° Fahr., and solidifies



when not heated beyond that temperature to a crystalline non-transparent mass. When heated but a few degrees above  $400^{\circ}$  Fahr. it solidifies to a clear vitreous mass, without the least trace of crystalline structure, and which by friction becomes highly electrical. When alcohol is poured over it a number of cracks are formed all of a sudden, and with a certain degree of regularity; and when even but a thin layer of alcohol is suffered to remain on it, the whole mass is soon converted into an aggregation of regular crystals. The most remarkable circumstance however is, that the melting point of this vitreous amorphous lithofellinic acid is  $180^{\circ}$  lower than that of the crystallized; it melts between  $220^{\circ}$  and  $230^{\circ}$  Fahr. to a tenacious mass, which may be drawn out into threads. It can again be obtained crystallized by solution in alcohol. When kept for some time in a fluid state, at a temperature above its fusing point, but which has not yet been accurately determined, it sometimes solidifies at this temperature to a crystalline mass. Heated to fusion exposed to the atmosphere, it volatilizes in white vapours, having a faint aromatic smell.

Lithofellinic acid is easily soluble in caustic and in carbonate of ammonia, but separates on evaporation free from ammonia. The solution does not precipitate salts of lime or of barytes. It likewise dissolves in large quantity in caustic potassa; the saturated solution possesses but a slight alkaline action, and leaves behind on evaporation a clear gummy mass, which is soluble in water, but not in a solution of potassa. The solution is rendered milky by the chloride of ammonium; acids form in it a thick white, and, as it were, coagulated precipitate, which however soon sinks together, becomes pulverulent, and appears when dry white and earthy. Under the microscope it does not seem to be crystalline, but to consist of minute transparent particles. It is evidently the amorphous state of the lithofellinic acid, and melts at  $220^{\circ}$  Fahr.; it is contained in this state in the concretion.

The saturated solution of the potash salt affords with neutral salts of silver and lead white precipitates, which, on heating the liquid, become soft and of the consistence of plaster. The lead salt appeared to be sesquibasic, and afforded 32 per cent. oxide of lead; according to theory it should have given 32.8. A lead salt, which had been prepared from the saturated solution of the acid in ammonia, appeared to consist chiefly of the bibasic; it gave 41.45 per cent. oxide of lead, which according to theory should have been 39.5.

The silver salt dissolved continually on edulcoration; the solution on evaporation deposited a film, like cream on milk, and dried without becoming crystalline. The crystallized salt mentioned by Ettling and Will could not be obtained in this manner; they prepared it by mixing an alcoholic solution of the acid with nitrate of silver and some ammonia; a flocky precipitate was formed, which disappeared on being warmed, or on the addition of alcohol. On evaporation of this solution the silver salt crystallized out in long needles, which became black on exposure to light. It is conceivable that



the two conditions of the acid may be preserved in its salts, and thus give rise to salts possessed of different properties. The portion of the silver salt which remained on the filter afforded 25 per cent. oxide of silver.

Lithofellinic acid is soluble in concentrated sulphuric acid; the solution becomes turbid by the addition of water. It is also soluble in considerable quantity in concentrated acetic acid, from which it crystallizes on evaporation.

Two analyses of the crystallized acid gave—

		Atoms.		Calculated.
Carbon . . . . .	70.83	71.09	= 40	= 70.83
Hydrogen . . . .	10.60		= 72	= 10.48
Oxygen . . . . .	18.57		= 8	= 18.69
	<hr/> 100.00			<hr/> 100.00

The crystallized acid is therefore  $C^{40} H^{70} O^7 + aq$ , and the atomic weight of the anhydrous acid 4171. In one analysis, by Ettling and Will, of the silver salt, the atomic weight was found to be 4212, in a second 4276. They calculate from their analyses the formula  $C^{42} H^{74} O^7 + aq$  for the crystallized acid, which however pre-supposes the atomic weight of the anhydrous acid to be 4347.6. Professor Wöhler regards the formula adopted by him as being most probable, since it agrees in the number of atoms of carbon with that of the crystallized resins; and lithofellinic acid is, in fact, with respect to all its properties, nothing more than a resin.—*Götting. Gelehr. Anz.* 1841, No. 178.

*On a New Compound of Iodine and of the Oxide of Lead.* By  
M. DURAND.

Chemists do not yet admit the existence of compounds of iodine corresponding to the bleaching compounds formed by chlorine and bromine.

On dissolving iodine in a solution of caustic soda, M. Mitscherlich obtained crystals, which at first were supposed to be formed of soda and of an acid less oxygenized than iodic acid; but it is now generally admitted that these crystals, which easily decompose into iodide of sodium and into the iodate of soda, are a compound, in definite proportions, of these two salts, and that the hypochlorites yet remain to be discovered.

Whilst making some researches upon iodine, I have however observed the formation of a product which seems to offer some analogies with the bleaching chlorides, if not from its atomic composition, at least from the circumstances under which it is formed, and the manner in which it behaves towards certain agents.

I first obtained this compound by pouring a solution of the acetate or of the nitrate of lead into a liquor containing some carbonate of soda in which I had dissolved iodine, in the form of a very fine blue-coloured precipitate; but I found it preferable to use a solution of caustic soda in which iodine had just been dissolved.



According to the respective proportions of soda and of iodine, the precipitate which the salts of lead form is of a varied tint. The proportion of iodine is that of one equivalent for an equivalent of soda; a precipitate of an unstable red violet is obtained, which under water spontaneously decomposes into iodine and into a pulverulent matter of a beautiful blue tint. If, on the contrary, a quantity of iodine from three to four times smaller be added to the alkaline liquor, the precipitate presents the blue tint immediately, and the supernatant liquor then contains but very little iodine.

It is not necessary that it should have been previously combined with the soda to produce this blue compound. By triturating with the hydrate of the protoxide of lead some powdered iodine precipitated by water from the alcoholic or æthereal solution, an unstable red violet compound is also obtained, which likewise becomes blue by spontaneously losing a certain quantity of iodine.

M. Denot, in his work on the iodides of lead, states that he obtained a blue compound of iodine and lead; but although he neither points out its properties, nor the mode of preparation, he seems disposed to consider it as a metallic iodide, and to assign to it a constitution corresponding to that of the suboxide of lead. The compound which I have myself obtained, its mode of preparation, and the few experiments to which I have subjected it, have led me to a different opinion. It appears to contain iodine, lead and oxygen, like the bleaching compounds of chlorine, which, whatever may be the opinion adopted as to their nature, decidedly contain chlorine, oxygen and a metal.

This combination resists perfectly the action of water, which does not remove any iodine from it, nor does it yield to a solution of acetate of lead or of sugar any oxide of lead; edulcoration with these solutions might therefore allow of its being obtained in a state of purity.

The weakest acids however decompose it, with formation of a salt of lead and elimination of the iodine. Not only dilute sulphuric acid and nitric acids act in this way, but also acetic and even carbonic acid.

This blue compound, which may be preserved in a vacuum without losing iodine, decomposes by contact with the air, and is converted after a certain time into carbonate of lead. It is easy to prove, by means of paper moistened with starch, that this change is accompanied by a feeble but constant liberation of iodine.

Upon heating this blue compound it changes its tint, which passes into a canary yellow; and it seemed to me to convert it, without liberation of iodine, into a mixture of basic iodate and iodide of lead.

This property, and that of being decomposed by the weakest acids with liberation of iodine, appear to assimilate it to the bleaching compounds of chlorine.—*Journ. de Pharm.* for October, p. 311.



*Revision of the Atomic Weights.*

*Zinc*.—By direct oxidation with nitric acid, in one series of experiments, of common zinc (consisting of 0.003 carbon, 0.142 iron, 0.685 lead, and 99.190 zinc), and in another series, of pure zinc, which had been distilled in a dried current of hydrogen, Jacquelin finds the atomic weight of this metal to be 413.7. By decomposition of the sulphuret, which is said by him to afford a pure oxide of zinc, 413.5 and 414.6 were obtained. He regards 414 as the atomic weight, being the mean of the above results. [According to Berzelius it was 403.23.]

*Chlorine*.—By decomposition of oxide of copper by means of hydrochloric acid gas, determination of the increase in weight and of the water (the equivalent of this being taken at 112.50), Marignac obtained for atomic weight of chlorine the number 450.013, according to which that of *silver* is 1374, and (these two being taken respectively at 450 and 1375) that of potassium 498.5 (or in round numbers 500). Laurent, on the contrary, confirms Berzelius's atomic weight of chlorine.—*Compt. Rend.*, t. xiv. pp. 456, 570, 636.

*Tests and Antidotes for Bromine.*

The tests for bromine in general require the presence of the element to be manifested by the peculiar colour of the body. There is however an exception to this rule in a new test which was suggested to me by my friend Dr. George Wilson, viz. the chloride of gold; the solution of this salt giving a red tinge with hydrobromic acid, or an electro-positive hydrobromate.

When bromine exists in an organic mixture, since it is sure to be in a state of combination, caustic potash should be added to the mass, which should then be reduced to an ash, exhausted by distilled water, and chlorine passed through the solution, or the chloride of gold added to it previously carefully neutralized by hydrochloric acid. When chlorine is used, starch may render the presence of the element more perceptible. I have tried experiments on the relative delicacy of tests, and prefer the chloride of gold. Nitrate of silver is a delicate test where the bromine is not mixed with chlorine; the bromide of silver is distinguished from the chloride by heating with hydrochloric acid and chlorite of lime, when ruddy fumes are evolved if bromine be present.

M. Barthez has proposed magnesia as an antidote for bromine. From several experiments, it appears that the bromide of magnesium is by no means an active salt; neither is it inert. From experiments performed on rabbits, I conclude starch in solution and white of egg to be excellent antidotes to the poison.—Dr. Glover, in his Essay on Bromine, *Edinb. Med. and Surg. Journ.*, No. 152.

*Blue Urine.*

This secretion has been observed by Dr. Bögner in two patients, one of whom died soon afterwards of *Marasmus senilis*. In the



other, who was moreover troubled with the dropsy, irregular purple spots were formed on the skin after puncturing of the abdomen, which subsequently opened and discharged a *blue* liquid, and the purple spots then diminished in size. He was cured, but five years afterwards had the dropsy again, and died, without discharging a blue liquid this time, even after scarification of the feet. Neither of the patients had taken preparations containing iron or prussic acid. The suspended colouring matter soon deposited itself in both cases from the blue liquids. The sediment dissolved in boiling muriatic acid, and was decolorized by solution of caustic potassa with precipitation of a yellow powder. The muriatic solution was coloured blue by ferrocyanide of potassium, black by tincture of galls; the solution in potassa became red by solutions of copper, and blue by solution of iron. The sediment was therefore chiefly prussian blue. —Casper's *Wochenschr.*, 1842, No. 3.

*On the Composition of the Native Boracic Acid of Tuscany.*

By M. WITTSTEIN.

This substance, which at present occurs in such large quantities in commerce, is somewhat impure, and always affords on purification a product containing sulphuric acid. When heated, it evolves ammonia, sulphurous acid, water, and empyreumatic matter, and becomes of a dark colour: on being heated to redness it loses more than 50 per cent. A residue of about 60 per cent. is obtained on dry distillation, which is gray, and contains ammonia; an aqueous product, which smells strongly of sulphurous acid, evolves ammonia on being treated with potash, and affords a white precipitate with nitrate of silver; moreover a sublimate containing much ammonia, of a saline taste and of difficult solution in water. Borate of ammonia is not volatilized by heat, but is decomposed.

The analysis of the acid afforded the following results:—

Crystallized boracic acid with 3 atoms water	76.494
Water	6.557
Sulphuric acid	1.322
Silica	1.200
Sulphate of ammonia (anhydrous)	8.508
... .. magnesia	2.632
... .. lime	1.018
... .. soda	0.917
... .. potash.	0.369
... .. peroxide of iron.	0.365
... .. alumina	0.320
... .. protoxide of manganese	traces.
Chloride of ammonium	0.298
Organic substance	traces.
	<hr/> 100.000

Perfect certainty as to the presence of fixed alkalies could only be obtained after getting rid of the boracic acid. In a qualitative experiment the latter was removed by heating the crude acid with



fluor spar and sulphuric acid as fluoride of boron; the alkalies were then easily found in the residue. The direct quantitative determination of the boracic acid is very difficult. In the first case the crude acid was extracted with absolute alcohol, the boracic acid dissolved with the aid of the excess of sulphuric acid present. The sulphuric acid in the residue was determined in order to find out the quantity which had dissolved with the boracic acid, by subtracting from the entire amount previously ascertained; the alcoholic liquid was then precipitated by a weighed quantity of the hydrate of the oxide of lead, the precipitate ignited, and the boracic acid calculated from its weight. An excess of more than 2 per cent. was obtained, arising from dissolved sulphates, &c. The alcoholic extract of the crude acid was now treated with excess of ammonia, and left to stand, being frequently stirred for 24 hours; the white salt which had separated was collected, and dissolved together with the crystalline crusts attached to the sides of the vessel, and the alcohol removed almost entirely by distillation; and the residue added to the aqueous solution, and treated as above with the hydrate of the oxide of lead. The excess amounted now to more than 3 per cent., probably from less boracic acid having been volatilized with the vapours. Nevertheless the alcohol obtained by distillation burnt with a green flame. The determination of the boracic acid by the loss appears therefore to be the best.

For preparing a boracic acid suitable for most purposes, the purification of the commercial boracic acid is far more advantageous in a pecuniary respect than decomposing borax. For preparing *chemically pure* boracic acid, decomposing borax with muriatic acid deserves the preference.—*Buch. Repert.*, xxii. p. 145.

#### *Artificial Ultramarine.*

This is occasionally formed in preparing *Antim. diaphor. ablutum*, and frequently also in the preparation of milk of sulphur. When chlorated water is added to a solution of sulphuret of potassium made with common potash and sulphur of commerce, green or blue flakes are thrown down. The earthen vessels in which the melting process has been effected, no doubt afford the alumina, silica, and iron.—*Jahr. für Prakt. Pharm.*, iv. p. 83.

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## ANALYTICAL CHEMISTRY.

*On the Use of the Glass of Borax in Quantitative Analysis.* By  
COUNT F. SCHAFFGOTSCH.

IN combinations of carbonic acid which are easily decomposed by heat, it is usual to ascertain its quantity by the loss, while those compounds which are decomposed with difficulty, or not at all at a red heat, are analysed by treatment with a weighed quantity of a dilute acid. In this latter case all escape of aqueous vapour must be guarded against by a tube containing chloride of calcium. It seemed far more simple to employ, instead of the dilute acid, a non-volatile and fusible



acid, for instance, boracic acid, which, as is well known, expels on melting the carbonic acid from its combinations. I soon found, however, and have since confirmed it by numerous experiments, that the fused boracic acid does not afford accurate results, as by long melting over an Argand lamp it continually decreases in weight. On melting 1·8 gramme of anhydrous boracic acid four times, and each time for about 20 minutes, it decreased successively 4,  $2\frac{1}{2}$ , 3, and 5 millegrammes, on the whole therefore  $14\frac{1}{2}$  millegrammes. From whatever cause this loss may arise, it is evident that the quantity of carbonic acid to be found would be apparently increased. The biphosphate of soda and bichromate of potash are likewise unfit for this purpose, as they cannot be brought to a constant weight. The anhydrous biborate of soda or glass of borax, on the contrary, answers all expectations; it is absolutely fixed, and as it is but slightly hygroscopic, may be weighed with accuracy; it moreover decomposes the carbonates very easily in fusing, and causes no ebullition, on account of its thick fluidity.

The fitness of the glass of borax for the purposes in question results theoretically from what has been stated; it appeared not unimportant however to test it practically on carbonates of known composition. The method was as follows:—From 2 to 7 grammes of pure transparent biborate of soda were melted in a platinum crucible over an Argand lamp, and after cooling carefully weighed. A weighed quantity of the carbonate salt was then added, either in the state of powder or in pieces; a gradually increasing heat applied, until after about a quarter of an hour the whole fused quietly to a clear glass. The weight of the cooled crucible gave the quantity of carbonic acid as loss. Repeated melting altered in no case the first weight. The following table will show how far the results agree with the calculation.

Carbonates.	Weight in grammes.	Loss in grammes.	Loss in 100.	Calculated.
Carbonate of lime, Iceland spar .....	0·5095	0·225	44·16	43·66
The same .....	0·8500	0·375	44·12	—
Artificial carbonate of strontia .....	0·6137	0·1857	30·27	29·88
Artificial carbonate of barytes.....	0·4845	0·1085	22·37	22·38
Semi-fused carbonate of lithia .....	0·3000	0·1085	60·17	60·46
Fused carbonate of soda .....	0·5925	0·245	41·35	41·37
Crystallized bicarbonate of potash.....	0·3000	0·1605	53·50	52·96

75·85 is here adopted as the atomic weight of carbon.

As in this last experiment the loss consists in 2 atoms of carbonic acid and 1 of water, it affords, properly speaking, no determination of the carbonic acid, but of the potash.

It was thought probable that the amount of alkaline bases in organic salts might be ascertained in a similar manner, as they are converted into carbonates by heat; but the glass of borax can only be employed direct with the oxalates, as the other organic salts deposit at a red heat too much carbon, which mixes with the glass of borax, and cannot be burnt.



Nitric acid may be separated quantitatively from the alkalies just as well as the carbonic acid by the same means; only with them it is absolutely necessary to mix the nitrate and the glass of borax, in a finely powdered state, one with the other; otherwise, on the decomposition of the former by heat, a violent frothing and ebullition occurs, which, notwithstanding the greatest attention, gives rise to a loss of from  $1\frac{1}{2}$  to 3 per cent.

I have analysed the nitrate of barytes, the nitrate of soda, and the potash salt, with this precaution, heating the mixed powder gently and for some time previous to weighing, in order to remove the hygroscopic water which the glass of borax might have taken up during pulverization. The quantity of glass of borax employed amounted in all the experiments to nearly 2 grammes.

	Grammes.	Per cent.	Calculated.
I. 0.566 nitrate of barytes lost	0.233	or 41.17	41.44
II. 0.642 nitrate of soda lost...	0.4085	or 63.63	63.40
III. 0.565 nitrate of potash lost	0.3025	or 53.54	53.44

The same method may without doubt be applied to the nitrites, and probably likewise to the arsenites and arseniates. It did not prove successful with phosphates, sulphates, and fluorides; it was found that phosphate of soda and sulphate of barytes are not at all decomposed by fusing with glass of borax, and sulphate of potash and fluoride of calcium but very slightly.—Poggendorff's *Annalen*, No. X. 1842, p. 263.

#### *Test for Magnesia.*

When magnesia is mixed with alkalies, it is rather difficult to separate them for qualitative analysis. Mr. Parnell proposes to dissolve the mixture in water, and precipitate the magnesia by the addition of sulphuret of barium; the filtered solution may then be tested for lithia by phosphate of soda; but in almost every case a precipitate is obtained by carbonate of soda, which might lead to suppose the presence of lithia, while it is only unprecipitated magnesia. Perhaps Liebig's method with baryta, or Phillips's with lime, would be preferable. Berzelius's method is given in our first Number; the ordinary one is to convert the mixed bases into acetates, then to ignite and extract the alkaline carbonates with water. Lithia is perhaps best tested for by the red colour which it imparts to the blowpipe flame.

Mr. Parnell's table for the qualitative determination of the four earths, baryta, strontia, lime and magnesia, does not appear to be very convenient. We would propose the following:—

Add carbonate of ammonia to the solution after being neutralized by ammonia.

*Not precipitated.*

To original solution add solution of sulphate of Magnesia.  
lime, and allow to stand for some hours.

Precipitated immediately, or after a time, baryta Lime.  
and strontia.

To distinguish these two earths, add to solution hydro-fluosilicic acid. Baryta is precipitated, strontia is not.



In the analysis of salts, &c. it simplifies the process very considerably if the parts soluble in water, hydrochloric and nitric acids, &c., are examined successively; by this means we frequently obtain a clue to the composition of the body at the first step. The benefits of this method have been pointed out by Rose, but Mr. Parnell seems to have somewhat neglected it in his recent work. It is our intention to give several notices on this and other subjects connected with analytical chemistry in our ensuing Numbers, but from press of matter this intention must be deferred for some time.—EDITORS.

### *Cochineal a Test for Protosalts of Iron.*

Kastner recommends the use of this substance as a reagent. Cochineal is first freed from fat by means of æther, and then extracted with water; the solution is coloured violet by salts of the protoxide of iron.—*Archiv der Pharm.*, xxxi. p. 35.

### *Chloride of Gold as a Test of certain Vegetable Alkalies.*

MM. Larocque and Thibierge find that perchloride of gold is a more decisive test of certain vegetable alkalies than the double chloride of sodium and gold already employed for this purpose. The following are the colours of the precipitates which it produces with the salts of the annexed alkalies dissolved in water:—Quinine, buff-coloured: Cinchonine, sulphur-yellow: Morphine, yellow, then bluish, and lastly violet; in this last state the gold is reduced, and the precipitate is insoluble in water, alcohol, the caustic alkalies, and sulphuric, nitric or hydrochloric acids; it forms with aqua regia a solution which is precipitated by protosulphate of iron: Brucine, milk-, coffee-, and then chocolate-brown: Strychnine, canary-yellow: Veratrine, slightly greenish yellow.

All these precipitates, with the exception mentioned, are very soluble in alcohol, insoluble in æther, and slightly soluble in water. These precipitates appear to be combinations of gold, chlorine and the vegetable alkali, for their alcoholic solutions treated with tannin give a greenish blue precipitate of reduced gold; if the solution be filtered, and the alcohol be evaporated by heat, a precipitate of tannate of the alkali employed is formed. The liquor again filtered, gives with nitrate of silver a white precipitate insoluble in nitric acid, but soluble in ammonia.

Among the reactions of chloride of gold, there are two which to the authors appear to be especially important; they are those which occur with morphine and brucine; these are sufficiently marked to prevent these alkalies from being mistaken for each other, and also yield pretty good characteristics for distinguishing brucine from strychnine.

MM. Larocque and Thibierge detail also various experiments on the modes of detecting opium proposed by Dr. Christison, and they mention that their results differ much from his. They state that these differences may arise from three causes,—1st, the inequality of the com-



position of the opium of commerce ; 2ndly, the analytical process employed by Dr. Christison, which consisted in decomposing the meconate of lead by sulphuretted hydrogen—this the authors show frequently masks the meconic acid, and that it can only be detected by decomposing the meconate of lead with dilute sulphuric acid ; 3rdly, the variable nature of the liquids with which opium is mixed.

The authors have also, as the results of their experiments, arrived at the following conclusions :—

1st. By the aid of reagents it is possible to determine the presence of morphine, strychnine and brucine in substances, which, after being mixed with the salts of these alkalies, have undergone the vinous, acetic or putrefactive fermentation. M. Orfila has already shown that the putrefactive fermentation does not alter morphine.

2ndly. Crystallized iodic acid, or a concentrated solution of this acid, is susceptible of being decomposed by neutral azotized bodies ; but a dilute solution of this acid cannot be decomposed by them unless there be added concentrated sulphuric acid, crystallizable acetic acid, oxalic, citric or tartaric acid.

3rdly. Iodic acid should not be employed as a test of morphine without the greatest caution.

4thly. Perchloride of gold produces such effects with the vegetable alkalies, as serve to distinguish morphine, brucine and strychnine from each other.

5thly. The reagents on which the greatest reliance may be placed as tests of morphine are, nitric acid, neutral perchloride of iron, and perchloride of gold.

6thly. By the use of reagents, morphine which has been mixed with beer, soup or milk may be detected.

7thly. It is also easy to prove by reagents the presence of meconic acid in soup or milk, especially when the meconate of lead is decomposed by dilute sulphuric acid.—*Journal de Chimie Médicale*, Octobre 1842, and *Philosophical Magazine*, December 1842.

## PHARMACOLOGY.

*On Galbanum.* By M. LUDWIG.

THIS resinous gum was formerly supposed to owe its origin to *Bubon gummiferum*, Linn. (*Ferula galbanifera*, Com. Hort.), which plant grows in Southern Africa, as also the nearly allied species *Bubon galbanum*, Linn. (*Ferula galbanifera*, Herm.), both of which occur frequently in the botanic gardens of Europe ; but as they do not possess the slightest odour of galbanum, that opinion is evidently untenable.

This drug is ascribed with more probability to *Ferula galbanifera*, Löbel, who cultivated this plant from the seeds which are frequently met with in many kinds of galbanum ; it cannot however be admitted that all the galbanum derives its origin from this plant ; a portion might perhaps be obtained from *Galbanum officinale*, Don, which



is often mentioned in recent works as the mother-plant, and which is said to be common in the Levant and in Syria; but even this is uncertain, and can only be settled by observations made on the spot.

Three kinds of galbanum occur in commerce:—

1. Galbanum in tears (*Galbanum in granis*), which is evidently the best kind, in grains either irregular, unconnected or agglutinated, but easily separable, from the size of a small pea to that of a hazel-nut, and generally tear-shaped, the colour being yellow with an inclination to white or green. Its smell is strong, penetrating and peculiar, and not altogether disagreeable; taste acrid, resinous, and somewhat bitter; sp. gr. 1.212; it becomes soft between the fingers, and on the surface of cleavage has a faint resinous lustre.

2. Galbanum in lumps (*Galbanum in massis*) are large pieces varying in colour, sometimes yellow, sometimes strongly green, consisting in part of grains connected by a viscous mass, in which hairs and other impurities are of frequent occurrence; sometimes stems and leaf-petioles are met with. The smell is similar to the first kind, frequently more penetrating, and in consistence much softer. Both these kinds (Levant galbanum) differ essentially from

3. The Persian galbanum, which undoubtedly has quite another origin. It occurs in commerce in large lumps, packed in skins or in mats, and is of a brownish red colour with white stripes; in consistence it is so soft that it frequently melts at the common temperature; it is very impure, containing fragments of stems; the smell differs totally from that of the two kinds above-mentioned, and frequently calls to mind that of assafœtida; its taste is disagreeable, resinous and bitter. That it owes its origin to some other source is evident from the following points:—

1. The colour is never greenish, but reddish brown.

2. The smell is so totally different that it can never be confounded with the other kinds.

3. It always occurs in commerce more impure, and never in grains or in the form of the Levant galbanum; and the fragments of stems which are imbedded in it are of quite a different kind and much thicker.

4. It is imported from different localities. Persian galbanum always comes from Astracan and Orenburg, and it is this kind which has always been used in Russia, and which even forms an article of export; while the Levant galbanum is chiefly imported to Trieste and Marseilles, and has only been recently known in Russia.

Levant galbanum appears in general to meet with more application and approbation in Europe, since the exportation of the Persian kind from Russia is constantly on the decrease.—*Arch. der Pharm.*, xxviii. p. 231.

M. Göbel, in a recent paper on several of the drugs of the Russian commerce, inserted in the ‘*Annalen der Chem. und Pharm.*,’ xlii. p. 320, observes that galbanum is brought from Persia by Astracan into Russia, and is then exported from St. Petersburg in considerable quantities. The druggists there open the original



packages and sort the contents, to comply with the demands of their customers. The names of *Galbanum in granis, in sortis, in massis*, &c. are then applied to the sorted qualities. All these varieties of galbanum occur mixed up together in the original packages. Sometimes one will contain a very excellent article, while another of the same importation encloses a very inferior kind.

The coarse and ignorant manner in which this important drug is collected in Persia is pretty evident from the fact, that frequently among twenty to thirty packages of galbanum, two, three, and even four cases are found which contain no galbanum, but sagapenum instead, which is never imported under this name, but is always found, with the name of galbanum attached to it, among the galbanum cases.

During M. Göbel's residence in Astracan, in the summer of 1834, there was a quantity of galbanum for sale in a stall of the Persian market. It was packed in skins with the hairy side inwards, then sewed into mats and laced with cord. These packages had the form of a large round cake, of about 3 feet in diameter and 1 in thickness. The weight of such a package might probably amount to from 60 to 80 lbs. There were about thirty such parcels there, and one was opened that its contents might be seen and tested. The galbanum was of the soft kind, of yellowish brown colour, without any grains being mixed with it, but of powerful penetrating smell. The sale of this drug is effected here in a curious manner. The purchaser has the right to cut open any one package to test the contents, and to offer accordingly. The other packages cannot be opened until the bargain is concluded, and the advantage or disadvantage, according to whether they contain good or inferior qualities, is all on the side of the purchaser. Single packages are never sold. When a transport arrives, the entire quantity must be disposed of at once. The seller in Astracan, who is merely a commissioner, generally an Armenian, knows as little of the quality of the merchandise in the closed cases as the buyer. This accounts for the occurrence of sagapenum among a number of such packages. The price of the galbanum at that time was low, viz. 2 rub. 82 kopecks for the pud (= 40 lbs.), that is, about threepence the pound. Ammoniacum is likewise imported from Persia over Astracan; assafoetida for Russian use never; this is always obtained from England.

### *On the Barks of Commerce.*

[Concluded from page 72.]

#### VI. CINCHONA CARIBŒA; *Caribbean or Jamaica Bark; Cortex Caribæus.*

This is a well-known bark, and is very fairly described in Göbel's 'Pharmacology.' It occurs at present very rarely in commerce. With respect to its chemical composition, it has great similarity with



the following, and contains like that a considerable quantity of kinova bitter.

VII. CINCHONA DE RIO JANEIRO; *Rio Janeiro Bark*; *China de Rio Janeiro*.

This bark, which is described and figured in Göbel's 'Pharmacology,' was obtained under the name of *China astringens brasiliensis*. In its chemical properties it resembles the *Cinch. nova surinamensis*, but contains more of a red oxidized tannin. 5 drachms of the bark afforded 15 grs. kinova bitter.

To this place belongs the Cinchona from Bahia, which is probably identical with *China alba* of Göbel. The yellow resin diffused throughout it is also kinova bitter.

VIII. CINCHONA ALBA; *White bark*; *Cortex Chinæ albus*.

This is the new bark recently described by Martiny, and which Martius considers to be the false Alcornoque. It contains a considerable quantity of easily purified kinova bitter.

It is evident from these experiments, that the barks of nearly all the plants hitherto known, and which are closely allied to the genus *Cinchona*, for instance the genera *Buenia* and *Exostemma*, contain no quinine or cinchonine, but kinova bitter in considerable quantity. This substance was likewise met with in nearly all the true Cinchona barks which were examined. M. Winckler does not consider kinova bitter to be identical with smilacine, as he could not succeed in preparing any compound resembling it from any one of the known kinds of *Sarsaparilla* which occur in commerce. A repetition of the elementary analysis of kinova bitter is therefore desirable. Constant compounds of it may be very easily prepared by mixing intimately pure and finely pulverized kinova bitter with double the quantity in weight of freshly prepared dried hydrate of lime, boiling the mixture with 24 to 30 times its weight of water for some minutes with constant stirring. The kinova bitter combines with the lime to a compound easily soluble in water, and may be separated by means of acids quite unchanged. This lime-compound is well adapted for the preparation of combinations with metallic oxides; it is only necessary to add gradually dilute nitric acid until the alkaline reaction arising from the excess of lime disappears, to separate the liquid by filtration from any kinova bitter that may be thrown down, and to add solutions of sulphate of copper, nitrate of silver, or acetate of lead to the solution, previously diluted, to obtain the corresponding metallic compounds. The two last salts separate immediately in the form of a white gelatinous precipitate; the combination with copper is of the same gelatinous nature, but is of a pale blue colour, and dries to a loose, easily pulverized, shining dark green mass. The liquid neutralized exactly with nitric acid, and has neither acid nor alkaline action.



TABULAR VIEW OF THE AMOUNT OF ALKALIES IN THE TRUE  
CINCHONA BARKS.

		In 16 oz.	
		Grains.	
<i>Barks containing Quinine.</i>			
1.	<i>Cinchona regia</i> (best kind, in naked thick flat pieces)	.	164
2.	<i>Cinch. Jaen pallida*</i> (in heavy and moderately-sized quills)	.	28
<i>Barks containing Cinchonine.</i>			
3.	<i>Cinch. rubiginosa</i> :—		
	a. The best heavy kind	.	256
	b. The poorer kind	.	77
4.	<i>Cinch. Huanuco</i> (in heavy moderately-sized quills)	.	190
5.	<i>Cinch. flava fibrosa</i> (in heavy covered flat pieces)	.	81
<i>Barks containing Quinine and Cinchonine.</i>			
6.	<i>Cinchona carthagena dura optima</i> :—	Cinchonine. Quinine.	
	a. <i>Cinch. flava Cusco</i>	.	260 grains, consisting of equal parts cinchonine and quinine, and a little aricine.
	b. The common sort of commerce	.	16.3 gr. 2.4
7.	<i>Cinch. rubra</i> :—		
	a. Dark-coloured heavy flat pieces	.	180 8
	b. Lighter kind, in thin flat pieces	.	80 6
8.	<i>Cinch. Loxa</i> (in moderately thick quills)	.	23 33
9.	<i>Cinch. Jaen. nigricans</i> s. (Pseudo-Loxa in moderately thick quills)	.	2.8 0.7
10.	<i>Cinch. Huamalies</i> :—		
	a. In thick quills and slightly curved pieces	66	23
	b. In heavy covered moderately thick quills	8	0
	c. In thin quills, which were mixed with Loxa bark	8.5	0.6

*Barks containing Aricine.*

<i>Cinchona Cusco vera</i>	.	.	.	.	.	.	.	.	.	107.5
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*Barks containing Kinova Bitter.*

<i>Cinch. nova surinamensis</i>	.	.	.	.	.	.	.	.	.	261
<i>Cinch. nova flava</i>	.	.	.	.	.	.	.	.	.	134
<i>Cinch. de Rio Janeiro</i>	.	.	.	.	.	.	.	.	.	384
<i>Cinch. Piton</i>	.	.	.	.	.	.	.	.	.	256
<i>Cortex Caribæus</i>	.	} the amount of kinova bitter undeter-								
<i>Cinch. alba</i> (Martiny)	.									

Buch. Rept., xxv.

\* The light *Jaen Cinchona* seldom occurs now in commerce, and then only mixed with other barks, more especially with *Loxa Cinchona*.



*On the proper Time for collecting certain Roots.*

The importance of determining which is the best period of the year for collecting certain medicinal plants has been pointed out by Buchner. Nentwich employed the following method for the purpose of ascertaining this point. The plan, although short and easy of execution, does not give any idea of the peculiar constituents of the samples.

He cleansed the fresh roots from adhering earth by means of a brush; a certain quantity was then dried in the air, and its loss of weight remarked; it was then boiled several times with water, the extracts evaporated down to 4 oz., clarified with white of egg, filtered, edulcorated, and the filtered solution reduced to 3 oz., and when cold the specific gravity determined.

Only the following roots have as yet been examined:—

Name of the root.	Quantity employed.	Dried in the air.	Quantity of dry root extracted.	Spec. grav. of the clear extract evap. to 3 oz.
	oz.	$\frac{z}{3}$ $\frac{3}{2}$ gr.	oz.	
<i>Rad. Taraxaci</i> in autumn..	12	3 2 52	2	1·120
... .. in spring...	12	2 4 12	2	1·095
<i>Rad. Bardaniæ</i> in autumn.	12	3 2 36	2	1·147
... .. in spring...	12	2 0 0	2	1·062
<i>Rad. Saponariæ</i> in autumn	6	2 0 56	1	1·044
... .. in spring..	6	1 5 3	1	1·032
<i>Rad. Cichorei</i> in autumn...	6	1 5 39	1	1·080
... .. in spring.....	6	1 2 8	1	1·040

*Pharm. Centr. Blatt.*, 1842, p. 668.

## CHEMICAL PREPARATIONS.

*On Liquor Stibii Muriatici.* By M. GEISELER.

THE earlier methods of forming this preparation, by distilling a mixture of *Stib. oxyd. fuscum* and chloride of sodium with muriatic acid, afford no constant preparation, and the recent ‘Pharmacopœia Borussica’ has judiciously prescribed the dissolving of oxide of antimony in muriatic acid; the difficulty however is, at present, how to prepare the pure oxide. It is well known that dilute nitric acid alone does not afford an oxide free from metallic antimony and the other stages of oxidation. The following experiments were therefore made to resolve this question:—

1. 2 oz. of metallic antimony (finely pulverized and not quite free from sulphur and arsenic) were digested with 8 oz. water and  $1\frac{1}{2}$  pure hydrochloric acid of 1·110, at from 100° to 122° Fahr., until all evolution of sulphuretted hydrogen had ceased. 6 drachms of pure nitric acid of 1·205 were then added, and the whole quickly



placed aside at a temperature of from  $80^{\circ}$  to  $90^{\circ}$  Fahr. A very slight, and even on the application of heat merely transitory, action took place. The evaporated water was replaced, and another  $1\frac{1}{2}$  oz. hydrochloric acid and 6 drachms nitric acid added, and again left at  $80^{\circ}$  to  $90^{\circ}$  Fahr. After 24 hours, 6 drachms more nitric acid had to be added, and the same again after another 24 hours; and even this last addition did not effect a complete oxidation, and  $1\frac{1}{2}$  oz. hydrochloric and the same amount of nitric acid were therefore again added, and the whole heated to  $144^{\circ}$  Fahr., and at last to  $167^{\circ}$  Fahr. But even now it was impossible to cause the whole of the metallic antimony to disappear till after a renewed addition of 1 oz. more of the two acids. On the whole,  $4\frac{1}{2}$  oz. hydrochloric and as much nitric acid had been used. It was diluted with water and suspended, by which some metallic antimony remained behind; the oxide welledulcorated, treated with carbonate of soda, and againedulcorated. It now weighed, after drying, 2 oz. 3 drs. On being boiled with tartaric acid it left behind 9 per cent. antimonie acids and metallic antimony. Not a trace of arsenic could be detected by the blow-pipe.

2. The same experiment was made, but with the employment of crude hydrochloric acid (of 1.155) and crude nitric acid (of 1.310); 3 oz. 6 drs. of the former and 2 oz. 6 drs. of the latter were used; the oxide obtained amounted to 1 oz. 6 drs., and contained 10 per cent. antimony and antimonie acids.

3. 1 oz. antimony was left with 5 oz. water and 3 oz. crude hydrochloric acid until all evolution of sulphuretted hydrogen had ceased, and 3 oz. nitric acid added to it at once. In this manner, after having been left to stand (and frequent stirring) for 24 hours at a temperature of  $100^{\circ}$  to  $111^{\circ}$  Fahr., and further treatment as above, 1 oz. oxide of antimony was obtained, which contained 4 per cent. metal and traces of arsenic.

4. 1 oz. antimony was boiled with 4 oz. water and 4 oz. crude hydrochloric acid, and crude nitric acid added until the whole of the antimony was oxidized, the evaporated fluid being constantly replaced. 2 oz. were employed; 1 oz.  $1\frac{1}{2}$  dr. oxide of antimony was obtained, which contained no metal, but 20 per cent. antimonie acids.

5. 4 oz. of the sulphuret of antimony of commerce, finely powdered, and containing arsenic, lead, copper and iron, were gradually introduced into a mixture of 12 oz. crude hydrochloric acid and 6 oz. crude nitric acid, in which operation at first a violent frothing and evolution of nitrous acid resulted; sulphur and a black porous mass, which on further digestion became whitish gray and pulverulent, separated. The filtrated liquor was diluted with water, the separated andedulcorated Algaroth's powder treated with carbonate of soda, and in this manner 2 oz. of an oxide, not perfectly white, but almost entirely soluble in tartaric acid, was obtained, containing traces of lead and arsenic.

6. 12 oz. crude hydrochloric acid were poured over 4 oz. sulphuret of antimony, the evolution of sulphuretted hydrogen allowed



to pass by, and then heated to  $167^{\circ}$  Fahr., until all action had ceased. After cooling it was filtrated, and the liquid diluted with some water to the appearance of turbidness, the sulphuretted hydrogen left to escape, again filtered, and 6 times the quantity of water employed to precipitate the Algaroth powder, which was treated as above, and afforded 1 oz. 6 drs. *pure white* oxide of antimony, soluble *without* any residue in tartaric acid, and perfectly free from lead, copper and arsenic.

This last method may therefore be recommended for preparing pure oxide of antimony, and was employed in the following experiments:—

According to Döbereiner, in order to obtain a normal *liq. stibii muriat.*, which contains 47.67 per cent. sesquichloride of antimony and 11 per cent. free hydrochloric acid, it is requisite to mix 235 parts chloride of antimony with 258 parts hydrochloric acid of 1.21 spec. grav. How near a *liq. stib. muriat.* approaches the normal one, can neither be ascertained from the specific gravity nor from the degree of precipitation by water; far better results are afforded by taking as a standard the quantity of a solution of tartaric acid requisite to redissolve the milkiness at first produced on its addition to the *liq. stib. muriat.* The products obtained according to the following methods were nevertheless always submitted to a complete analysis.

*a.* 1 oz. pure oxide of antimony was boiled with 3 oz. pure hydrochloric acid until 1 oz. had evaporated. The filtered solution had a spec. grav. of 1.55; it contained 44.3 per cent. sesquichloride of antimony and 8.69 per cent. free hydrochloric acid. To produce a permanent turbidness in a solution of 30 grs. tartaric acid in 6 drachms water, 40 grs. were necessary.

*b.* As above, only that the heat was not allowed to exceed  $167^{\circ}$  Fahr. The product had a specific weight of 1.53, and behaved towards tartaric acid as the former; it contained in 100 parts 39.36 sesquichloride of antimony and 10.98 free hydrochloric acid.

*c.* As described under *a*, but with the employment of oxide of antimony prepared after the method described under No. 3. The specific weight of the product was 1.5; 40 grs. did not produce a permanent milkiness in the normal solution of tartaric acid. 100 parts contained 33.05 sesquichloride of antimony and 15.1 free hydrochloric acid.

*d.* 1 oz. metallic antimony was heated with 40 oz. hydrochloric acid to  $88^{\circ}$  Fahr., and half an ounce pure nitric acid added; on heating at once to  $167^{\circ}$  Fahr. the action was so violent that a portion of the liquid was lost; in a second experiment the metal was heated with the hydrochloric acid to  $167^{\circ}$ , and the nitric acid then carefully added by degrees. There was still metallic antimony after the employment of 1 oz. nitric acid, nor did it disappear entirely even after the addition of  $1\frac{1}{2}$  oz. more hydrochloric acid and 3 drs. nitric acid, heat being applied the whole time until the whole had evaporated to within 4 oz. It was nevertheless filtered, and a yellowish green product obtained of 1.58 spec. grav., of which 40 grs.



produced a considerable and permanent turbidness in the solution of tartaric acid; it contained in 100 parts 59.62 sesquichloride of antimony and 5.77 free hydrochloric acid.

*e.* The above experiment repeated, but with the employment of 6 oz. hydrochloric acid to 1 oz. metal at the commencement,  $2\frac{1}{2}$  oz. nitric acid were used. The liquid evaporated down to 4 oz., and filtered from the sediment, which was still considerable, had a spec. grav. of 1.55; 40 grains did not produce any considerable turbidness in the solution of tartaric acid; it contained in 100 parts 41.65 sesquichloride and 16.24 free hydrochloric acid.

*f.* 1 oz. sulphuret of antimony was digested, according to Döbereiner, with 3 oz. hydrochloric acid, until a quarter of a drachm of the liquid had evaporated. It was however necessary to add gradually 3 oz. more hydrochloric acid before complete solution was attained. After evaporating it to half, during which operation chloride of lead separated, it was filtered; it was yellowish brown, had a spec. grav. of 1.14; 40 grains of it produced no opakeness in the solution of tartaric acid; 100 parts contained 30.41 sesquichloride and 21.45 hydrochloric acid.

*g.* 1 oz. sulphuret of antimony was digested as above, with 4 oz. *crude* hydrochloric acid, and the whole evaporated to within 2 ounces. The filtered liquor had a spec. grav. of 1.59, and produced in the above-mentioned proportions a strong turbidness in the solution of tartaric acid; it contained in 100 parts 62.18 sesquichloride and 19.25 free acid.

*h.* The oxide of antimony was prepared according to the method described under No. 5, but after 4 oz. sulphuret of antimony had been introduced into the mixture of 12 oz. *crude* hydrochloric acid and 6 oz. *crude* nitric acid, it was filtered. The filtered liquor, which weighed 12 oz., had a spec. grav. of 1.45; 40 grs. produced no turbidness in the solution of tartaric acid, and it contained in 100 parts 32.4 sesquichloride and 12.91 free hydrochloric acid.

It is evident therefore that, on employing pure oxide, the method of the 'Pharm. Boruss.' under *a* affords a preparation which approaches closely to Döbereiner's normal liquor. The products obtained under *f*, *g* and *h* are very good for manufacturing purposes.—*Archiv der Pharm.*, xxx. p. 38.

#### *Preparation of Ferrocyanic Acid. By M. POSSELT.*

This acid, now sometimes also termed hydroferrocyanic acid, was discovered by Porret, and called by him ferrochyzic acid. According to M. Posselt the following is an improved process for obtaining it:—Agitate with æther a concentrated aqueous solution of ferrocyanic acid as obtained by the decomposition of ferrocyanide of lead by means of sulphuric or hydrosulphuric acid, the acid separates immediately and may be obtained by filtration; this remarkable separation of the acid from the water which holds it in solution requires but little æther. If the solution is moderately concentrated, the whole forms a thick mass by agitation, and after some



time the ferrocyanic acid suspended in the æther separates from the water saturated with æther, and swims on the surface. The water is to be removed by a pipette; the thick mass is to be put on a filter and washed repeatedly with a mixture of alcohol and æther, containing a considerable portion of the latter; it is then to be passed between folds of absorbent paper to remove the moisture, and afterwards to be perfectly dried over sulphuric acid in the air-pump.

In order to avoid preparing ferrocyanide of lead and the aqueous solution of ferrocyanic acid, a concentrated solution of ferrocyanide of potassium may be prepared in boiled water, and it is to be allowed to cool, entirely excluded from the air; it is then to be mixed with an excess of hydrochloric acid, also deprived of air, and this mixture is to be shaken with æther in the manner described. The acid separates in the same manner, and is to be dissolved in alcohol, to which a little sulphuric acid is to be added to combine with the potash which it may still contain; the liquid is to be filtered if it is not clear, and this alcoholic solution is to be agitated with æther; this again separates the acid, which is to be dried as before described.

This substance possesses all the properties of an acid, and presents a complete analogy with other hydracids. It has a very sour taste, an acid reaction, decomposing the carbonates with effervescence; it also decomposes with the greatest facility the acetates, tartrates, and even the oxalates. It does not when cold dissolve binoxide of mercury; but if it be heated the acid is decomposed into hydrocyanic acid, which forms a cyanide with the mercury of the binoxide, and into cyanide of iron, which is additionally oxidized at the expense of a part of the binoxide of mercury, and metallic mercury separates.

The ferrocyanic acid prepared by the process described is in the state of a white powder, frequently with a slight blue or yellow tint. When it is perfectly dry it may be long exposed to the air without alteration; when moist the decomposition takes place more rapidly: the acid becomes gradually blue, and is slowly and totally converted into Prussian blue.

It may be long exposed in a covered platina crucible to a temperature of  $212^{\circ}$ , and excluded from the air, without losing weight or suffering any sensible change; eventually, however, it is decomposed under these circumstances.

When it is more strongly heated, hydrocyanic acid is disengaged and cyanide of iron remains, which is oxidized. If it be heated in a current of carbonic acid gas, and the temperature be not raised above  $212^{\circ}$ , hydrocyanic acid is evolved and white cyanide of iron is left, and this decomposes also at a temperature somewhat above  $212^{\circ}$ . It is, as is well known, very soluble in water, and the solution submitted to ebullition in contact with air becomes blue; but without the presence of air it deposits, on the contrary, white cyanide of iron.

Ferrocyanic acid is even more soluble in alcohol than in water. It forms a syrupy, transparent solution, which decomposes either by long exposure to the air or ebullition. This solution under the air-pump yields mammillated hard crystals of a yellow colour.



The acid obtained as described is anhydrous, not losing, as already mentioned, any weight at a temperature of  $212^{\circ}$ . Two analyses gave the following results as the composition of this acid:—

	I.	II.	Calculated.
Cyanogen . . . . .	72.71	73.33	73.09
Hydrogen . . . . .	1.99	2.27	1.84
Iron . . . . .	25.22	25.08	25.06
	<u>99.92</u>	<u>100.68</u>	<u>99.99</u>

*Journ. de Pharm.*, Août. 1842, and *Phil. Mag.*, Oct. 1842.

### *Preparation of Ferridcyanide of Potassium.*

M. Posselt remarks that it is well known with what facility an excess of chlorine, when passed through a solution of ferrocyanide of potassium, decomposes the ferridcyanide of potassium as it is formed, and the difficulty which exists in completely separating the green substance which is then produced, because it readily passes through the filter. It is only by repeated crystallizations that the crystals are completely freed from it, and these operations are always attended with loss.

The following process is stated by M. Posselt to give pure and very fine crystals at once:—Pass chlorine gas through a very dilute solution of ferrocyanide of potassium, and evaporate it when the oxidation is complete, and add to the boiling liquor, when it is near its crystallizing point, a few drops of solution of potash; the green substance is then decomposed, and flocks of peroxide of iron separate. It is very easy to observe the moment at which the object is attained, and care must be taken not to add too much potash, because an excess of it would convert the ferridcyanide of potassium into ferrocyanide. The solution is to be filtered hot to separate the peroxide of iron; it possesses a deep purplish red colour, is to be cooled very slowly, and then fine crystals of the salt are obtained.—*Ibid.*

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*On the Compounds of Carbon and Iron, and the Determination of Carbon in Cast Iron, Steel and Wrought Iron.* By CONRAD BROMEIS, Ph. D. of Cassel.

THERE is no question of such theoretical or practical interest in the whole range of chemical science which has for such a length of time remained involved in hypothetical obscurity as the following:—What is the chemical connexion which exists between carbon and iron, or what part does the carbon play in the various kinds of iron, as cast iron, steel and wrought iron?

The cause of this does not so much lie in the importance of the subject not being sufficiently acknowledged, but in the imperfection



of chemical analysis as regards these compounds. Though after a great number of attempts on the part of the most distinguished chemists Berzelius at length succeeded in discovering an accurate method for determining the whole quantity of carbon contained in iron, still the evil was only half remedied, since until the present moment there existed no means of separating the most important part of the carbon that is combined with the iron, viz. that which is chemically united, from that which is only mechanically mixed with the metal, nor of determining each, even by approximation.

Although the method discovered by Berzelius, of dissolving the iron in chloride of copper, affords excellent means of determining the quantity of carbon combined with the iron, still this method requires considerable time for performance, as well as an experienced manipulator, and very complicated apparatus, such as is not found in every private laboratory. I therefore recommend the plan proposed by Regnault, which consists of subjecting the iron and carbon to combustion, and determining the latter as carbonic acid. About 3 grammes of the compound to be examined, after being triturated by means of a good English file or a good steel mortar, and then passed through a fine sieve, are mixed with 40 or 50 grammes of chromate of lead and 6 grammes of pulverized chlorate of potash, which have previously been fused. This mixture is then introduced into a combustion tube of difficultly fusible glass, 1 foot in length, which is sealed at one end, after having filled the latter for about  $1\frac{1}{2}$  inch with a mixture of chromate of lead and chlorate of potash. After the mixture containing the iron compound has been introduced, the rest of the tube, constituting about a quarter of its whole length, is filled up with chromate of lead. The tube is then laid on a horizontal surface, and by gently knocking it a passage is formed above the mixture for the passage of the gas. It is then connected by means of a cork with a chloride of calcium tube and a potash apparatus, exactly similar to those used in the elementary analysis of organic bodies. The tube is introduced into a Liebig's furnace, and then covered gradually with burning charcoal, the whole combustion being conducted like that of an organic substance. A considerable evolution of oxygen takes place, the whole mass fusing together, the particles of iron which are visible on the surface burning with bright scintillations. If at length no more gas is evolved, the extremity of the tube is heated; a great evolution of oxygen again takes place, by which all unburnt matter is perfectly burnt, and all carbonic acid remaining in the apparatus is driven out.

This method has afforded me such accurate results, that the difference between the analyses of the same kind of iron never exceeds 0.2 per cent., and often no more than 0.03 or 0.01 per cent. The whole analysis takes no more than one hour to perform, whilst the method of Berzelius requires a week to perform one analysis.

The following method of determining the carbon, which is only mechanically combined with the iron, seems to be of still more importance than the preceding. Proceeding from the supposition,



that on dissolving compounds of iron and carbon in muriatic acid, that part of the carbon which is chemically combined with the iron must take part in the chemical action, and combine *in statu nascenti* with the hydrogen presented to it, whereas that portion of carbon which is only mechanically combined takes no part in the action, but remains behind in a free state, I treated different samples of the most different kinds of commercial iron with dilute warm muriatic acid. Besides the hydrogen there is evolved a considerable quantity of gaseous carburetted hydrogen, as well as a small quantity of a strong-smelling carburetted hydrogen, which becomes liquid below  $112^{\circ}$  Fahr., and which, after dissolving the iron in acid, remains mingled with the carbon that separates. This liquid carburetted hydrogen, notwithstanding that it evaporates only at a high temperature, may be driven out or decomposed by digesting the fluid for some days with dilute muriatic acid, so that at length the fluid retains only a slight smell. The carbon that is deposited is by no means affected during this process, so that it may easily and accurately be determined on a small weighed and dried filter. In this manner I obtained, even in the case of steel and wrought iron, results agreeing sufficiently well with one another, and in the case of cast iron the results agree as accurately as could be desired. The carbon determined in this manner, deducted from the carbon as determined by the method described above, gives the quantity of carbon chemically combined with the iron.

If the results obtained by me from about twenty analyses are taken into consideration, it will be found that some advance at least has been made towards the settlement of several much-debated questions, of which I shall in conclusion only select two, viz.

1. Does cast iron constitute or contain a polycarburet of iron, and does the most perfect white cast iron represent this compound in its purest state?

2. What difference is there between cast iron, steel and wrought iron, and why is no carbon separated out of cast steel, on allowing the latter, when in a state of fusion, slowly to cool, whilst cast iron, containing almost the same quantity of carbon, gives rise to this phenomenon?

In most chemical works it is stated, that crystallized white cast iron contains the greatest quantity of carbon, amounting to about 5.3 per cent., but that this quantity could, in a remarkable manner, decrease to about 4.2 per cent., without in the least altering the crystalline structure of the body; a difference which never occurs in other substances of a crystalline nature. Now I have obtained, in the case of the most perfectly crystalline white cast iron, in the mean never more than 3.8 per cent. of carbon, a result which is also confirmed by the numerous and accurate experiments of Berthier. The latter found, in white cast iron from various localities, in the mean only 3.6 per cent. carbon. It seems accordingly that the quantity of carbon in white cast iron is not the only cause of the crystalline structure of the latter, since such considerable differences, amounting to almost one-third of the whole carbon, could not occur



between different varieties of white cast iron. If now we endeavour to find something that shall replace the quantity of carbon wanting in some of these cases, it will be found from my analyses, that for this carbon is substituted a quantity of manganese, which often amounts to 7 per cent. According to others, the quantity of carbon in white cast iron amounts to more than 4 per cent., and according to others to as much below; so that these analyses (if they are to be trusted) all seem to prove that neither common cast iron nor white cast iron is a polycarburet of iron of determinate constitution\*.

This view seems to be confirmed by the answer to the second question. If, for instance, we consider the phænomena attending the slow cooling of cast iron, or the conversion of white cast iron into gray, we shall find exactly the same phænomena as are exhibited in the case of solutions or alloys, but never those shown by chemical compounds of determinate composition; for if iron at the high temperature of its fusion has become saturated with carbon, it deposits the latter for the greatest part just like any hot solution, unless the fused mass be of too thick a nature. The quantity of carbon retained in chemical combination is greater in proportion to the rapidity with which the iron solidifies, which depends partly on external circumstances, partly on the nature of the iron itself. Just as this fact is confirmed by experience, so is it also confirmed by analysis; for in white cast iron there is contained, according to my analyses, only 0.5 per cent. of carbon mechanically mixed, in other kinds almost 1 per cent., and lastly in gray cast iron 2.3 per cent.; so that the carbon chemically united amounts in the latter only to 0.9 per cent. According to the views stated above however this 0.9 per cent. suffices to supersaturate the iron. But if this be correct, no species of iron which deposits no carbon on cooling, ought to contain a quantity of chemically combined carbon varying much from 0.9 per cent. In fact this assumption is fully borne out by facts. Karsten found, as a mean of 5 analyses, that gray cast iron contained 0.85 per cent. of chemically combined carbon; I found 0.93 per cent. cast steel contains, according to the accurate analyses of Gay-Lussac and Wilson, about 0.93 per cent. carbon; I found as a mean in the hardest kinds of cast steel (mostly English steel) 0.97 per cent. carbon. The great approximation of these numbers proves, in the first place, that according to the former methods the quantity of carbon in cast steel had been over-estimated; for cast steel was a substance that, notwithstanding its great quantity of carbon, deposited none of the latter on slowly cooling. Should it be found that some kinds of cast steel contain more than 1 per cent. of carbon, this may easily be explained by the fact, that all steel, and especially cast steel, contains a small quantity of carbon mechanically mixed, which in hard but badly worked steel may become very large; and that besides steel solidifies at a much higher temperature, and is

\* Perhaps accurate measurements of the crystalline angles of the two varieties, one containing only carbon, the other both carbon and manganese, would throw some light on this subject.



much more tenacious than cast iron ; so that the separation of carbon is much more imperfect and difficult.

According to this view gray cast iron must be considered as a mixture of very impure cast steel with carbon. This may be one cause why gray cast iron may be so easily hardened on the surface. If, lastly, we compare wrought iron with steel, we shall be unable to find a limit between the two, if we are unwilling to place it at a percentage of 0.5 of carbon.

Though numerous analyses are still requisite in order to settle this question, so important for the theory of iron smelting, I was induced to record the above results in this paper. At least I think I have succeeded in pointing out the importance of quantitatively separating and determining the carbon chemically united with the iron and that only mechanically combined.

#### *Manufacture of Sulphuric Acid from Gypsum.*

Thaulow has proposed the following method for preparing sulphuric acid in large quantities from gypsum. The gypsum is reduced in iron or earthen retorts by heating with charcoal ; the carbonic acid which is evolved is not suffered to be lost, but is preserved for further use. The sulphuret of lime is mixed with some water, and the carbonic acid gas passed into it ; the sulphuretted hydrogen which evolves is conducted into leaden chambers, and there first burnt to water and sulphurous acid, and this latter oxidized in the usual way.—*Archiv der Pharm.*, xxvi. p. 186.

## PROCEEDINGS OF THE CHEMICAL SOCIETY OF LONDON.

*Nov. 15th.*—(Professor Graham, President, in the Chair.) “ On some of the Astringent Substances, as the sources of Pyrogallic Acid ;” by Mr. Stenhouse. After discussing the propriety of dividing the varieties of tannin found in the vegetable kingdom into two classes, namely, those which give black and those which give green precipitates with salts of iron, and proving that the experiments of Cavallus, on which Berzelius and Liebig had formed an opposite opinion, were incorrect, the author proceeds to the examination of the tannin in a variety of astringent substances. The first of them was sumach, from which Dr. Stenhouse succeeded in extracting gallic acid and tannin, the latter yielding pyrogallic acid as freely as the tannin of galls, and appears to be more analogous to nut-galls than other astringent substances, as is well known to the Turkey-red dyers. In the conversion of tannin into gallic acid, the author recommends the use of sulphuric or muriatic acid, diluted with seven or eight times its bulk of water, and a continued digestion for a day or so. If strong acid be employed, only one-half the quantity of gallic acid results, and a dark-coloured pulverulent substance, having strong acid properties, is formed. This substance is insoluble in cold water, and only very slightly soluble in boiling water ;



soluble in cold and hot alcohol, and readily dissolved by the alkalis, forming dark brown solutions. Dr. Stenhouse proposes the name of melantannic acid for this substance. Valonia, oak-bark, divi-divi, kino and catechu were next submitted in order to examination. The first yielded a very small quantity of gallic acid, the second not any. Divi-divi contained it to a considerable extent, kino and catechu not at all. The tannin precipitated from all these substances by sulphuric acid did not yield pyrogallic acid, differing therefore entirely in this respect from that obtained from nut-galls and sumach\*.

The author concludes by stating that this is the first of a series of papers on the astringent substances.

“On some new Cases of Galvanic Action, and on the Construction of a Battery without the use of Oxidizable Metals;” by Mr. Arrott. It is an old observation, that a pair of platinum plates, which have been made the channel of an electric current employed in decomposing a fluid interposed between them, retain after separation from the battery a power of their own of inducing a current in the opposite direction to that of the original current, on metallic connection being made between them. This remarkable effect was described by the term “polarization of the electrodes.”

The phenomenon in question was afterwards referred by M. Becquerel to a current produced by the union of the acid and alkali, accumulated opposite to each other, on the electrodes by the action of the primary current of the battery; and this explanation has generally been deemed sufficient. Mr. Arrott observes however that the electricity thus produced is by no means in proportion to the energy of the chemical action taking place between the two bodies; and further, that currents of the most powerful nature may be called into play by the mutual action of two liquids, where nothing like the union of acid and alkali can occur. For example, solutions of protosulphates and persulphates of iron placed in contact, being merely separated by a porous diaphragm, and having a platinum plate connected with a galvanoscope plunged into each, gave proof of a very powerful current; and it was observed after some time that both solutions had undergone alteration, some of the persulphate having become reduced to protosulphate, and some of the protosalt peroxidized.

The current is in this, and a great number of similar cases, ascribed by the author to a simultaneous act of deoxidation of the one salt and oxidation of the other, performed by the elements of water, which under these circumstances become decomposed. The conditions for the establishment of a current by the action of two liquids on each other, being, that both these liquids shall be susceptible of undergoing chemical change in exactly the reverse order; the one shall have an attraction for hydrogen, the other for oxygen.

A number of pairs of this kind are mentioned, but the most

\* The gallic acid was proved in all cases by analysis, the details of which are fully given.



powerful combination was found to be a strong solution of sulphuret of potassium and concentrated nitric acid. With these liquids a compound battery of six alternations was constructed, the only metal employed being platinum, which was quite comparable in its effects, as measured by the voltameter, with many of the forms of battery, where the oxidation of zinc constitutes the source of the current. A small arrangement of the kind described was exhibited in action.

After entering at some length into a theoretical view of the mode of action of voltaic arrangements generally, and approximating the observed phænomena in all such cases to ordinary chemical changes, the author concludes by calling attention to the possibility of applying the principle laid down to the explanation of certain remarkable phænomena in organic chemistry, usually classed under the name of catalytic actions.

*Dec. 6th.*—(Professor Graham, President, in the Chair.) “Extract from a Letter from Dr. Will, dated Giessen, Nov. 10th, 1842.” “I have repeated Reiset’s experiments on the combustion of substances free from nitrogen with caustic soda and lime. The result is, that all his statements are extremely incorrect. There is not a trace of ammonia formed, if the alkaline mixture, as well as the employed substances, are quite pure; so that Reiset’s observations are not at all an objection to our method for determining nitrogen. I believe Reiset’s alkaline mixture contained nitre, otherwise he could not have got such erroneous results.

“From these experiments I was led also to repeat Faraday’s investigations on the formation of ammonia, and I think I shall find the cause why he sometimes obtained ammonia, and sometimes not, by heating organic substances containing no nitrogen, or zinc with hydrate of potash.

“In a few weeks I hope to be so far advanced as to be able to write a decisive paper on this subject, which I shall forward for the Chemical Society.”

“On *Æthogen* and the *Æthonites* ;” by W. H. Balmain. After alluding to some previous experiments on the subject of the combinations of nitrogen with silicon, boron, and the metals, published in the ‘*Philosophical Magazine*’ for October, the author proceeds to detail the preparation of the compound of nitrogen with boron, to which he has given the name of *Æthogen*, from its compounds with the metals producing a phosphorescent light in the oxidizing flame of the blowpipe. This compound is prepared by heating 7 parts of powdered anhydrous boracic acid with 9 parts of melon in a crucible lined with charcoal, and transferring the product rapidly into a well-stoppered bottle. It is a white powder, as light as prepared magnesia, infusible and fixed at a white heat, insoluble in water, but gives it an alkaline reaction. Heated with hydrate of potash, it yields ammonia abundantly; with potassium and zinc it yields *æthonides* of those metals. The preparation and properties of the *æthonides* of potassium, zinc, lead and silver, are then fully detailed; the process of preparation consisting generally in submitting



to heat, either æthogen directly with the metal, or the cyanide of the metal with boracic acid. These compounds are of a light colour, and all phosphoresce with a beautiful green light in the oxidizing flame of the blowpipe.

“Report of some Experiments with Saline Manures containing Nitrogen, conducted on the Manor Farm, Havering-atte-Bower, Essex, in the occupation of Collinson Hall, Esq. ;” by Mr. M. W. F. Chatterley. A field of wheat was chosen, which in the latter end of April presented a thin plant, the soil being strong clay, resting on the London clay. The salts employed, viz. nitrate of potash, nitrate of soda, and sulphate of ammonia, were top-dressed over separate portions of the land in the usual manner on the 12th of May, a part being left unmanured for the sake of comparison. The crop was mowed on the 10th of August, and the products from one-eighth of an acre from each of the portions of land mentioned were carefully measured and weighed.

The result generally showed a decided advantage on the part of the sulphate of ammonia, the quantity of grain being raised by the use of 140 lbs. of the salt per acre from  $23\frac{3}{4}$  bushels to  $32\frac{3}{4}$ . The increase in the straw was also very remarkable. The two nitrates also gave very good crops when employed at the rate of 1 cwt. to the acre, the cost of which however exceeded that of the 140 lbs. of sulphate.

The author observes, that the good effects produced by this manure are not always in proportion to the quantity used, and that it would be more advantageous to a farmer of limited means to top-dress slightly a great extent of land, than to put an abundant supply upon one or two fields.

Sulphate of ammonia was tried with success upon a poor pasture, notwithstanding the dryness of the weather, a state unfavourable to the success of these applications. With oats it answered perfectly well, and to a smaller degree with peas and tares; indeed its effects on the cereals were decidedly more marked than upon green crops generally.

The paper concludes with some valuable practicable suggestions on the mode of managing artificial manures, so as to yield the greatest profit upon the capital expended.

## REVIEWS.

*Is Selenium a True Element?* By SEPTIMUS PIESSE. London: R. Hastings.

THE author of this pamphlet attempts to show, by sundry additions and divisions of the atomic weights of oxygen, sulphur, selenium and tellurium, that selenium must be regarded not as an element but as an oxide. Allusion is made to Peligot's discoveries respecting uranium: we need not call to mind that they were made in quite a different manner, not by mere hypothetical reasoning, but by experiment, which latter course we would recommend in the present case as the only one likely to solve the author's doubts.



# THE CHEMICAL GAZETTE.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On a remarkable Substance from the Root of Athamanta Oreoselinum. By M. WINCKLER.*

THE author was informed by M. Büchner, that on adding *Tinct. sem. Colch.* to *Tinct. rad. Pimpinellæ*, a substance separated, which, on being treated with concentrated sulphuric acid, disengaged baldrianic acid, and exhibited with nitric acid similar phænomena of colours as colchicine, and might therefore be the baldrianate of colchicine. On repeating this experiment with tinctures of his own preparing, the author could not obtain this compound, but succeeded on employing the Pimpernel tincture of a neighbouring chemist. The tincture had evidently not been prepared from the *Rad. Pimpinellæ saxifragæ*, but from some other root. On the Rhine the herbalists frequently collect and sell the *Rad. Athamantæ Oreoselini* for the Pimpernel.

Tinctures were therefore made from the root of that plant, and also from that of *Pimp. saxifraga*, with alcohol of 0.863 spec. grav., and then evaporated in the water-bath to remove the alcohol and water. The residues agreed in being oily brownish yellow compounds, but that from *Pimpinella saxifraga* was characterized by a peculiar acrid taste, and disengaged on being treated with sulphuric acid, even after long standing, no smell of baldrianic acid; while the compound from the root of *Athamanta Oreoselinum* was less acrid, but had a more bitter balsamic taste, and on sulphuric acid being added to it gave off the smell of baldrianic acid, which became more powerful after a time. From this easy decomposition of the substance by sulphuric acid it is possible to distinguish the two roots both in their dry as well as fresh state; on moistening their cut surface with concentrated sulphuric acid, the latter affords the characteristic smell of baldrianic acid. The *Vin. sem. Colchici* was found to take no further part in the separation of the substance than distilled water, and at most only assisted it by an accidental greater or smaller amount of acid contained in it.

The combination is obtained from *Athamanta Oreoselinum* in the state of a hydrate, and best in the following manner:—A certain quantity of the dried and well-pounded root is extracted by di-



gestion with three times its weight of alcohol of 0·863 spec. grav., at a temperature of 125° to 145° Fahr.; the filtered extract heated in the water-bath to drive off the alcohol and water; the residue on cooling treated with from 6 to 8 times its weight of æther, the æthereal extract decanted from the undissolved portion, and decolorized as much as possible with pure animal charcoal, then filtered and left to spontaneous evaporation. The compound remains behind in the form of a thickish pale yellow oil, which is gradually converted into a crystalline mass. This is now dissolved in from 3 to 4 times its weight of alcohol of spec. grav. 0·863, to obtain the crystallized hydrate, and the solution poured in a continuous, but not too strong a stream, into 60 times its weight of cold distilled water, well-shaken and left to stand in as cold a place as possible. A white milky liquid is thus obtained, from which, after some days (sometimes, however, weeks elapse), the hydrate separates in the form of a caseous crystalline mass. The separation is assisted by the addition of a small quantity of acetic acid, or of the neutral sulphate of soda; but it is then difficult to purify the hydrate perfectly by edulcoration. From the saturated alcoholic tincture, especially when it has been prepared with alcohol of 0·863, the hydrate separates in considerable quantity, in perfectly colourless crystals, which very much resemble caffeine.

The separated hydrate is collected on a filter, and dried at from 50° to 60° Fahr., expanded on paper. Dried, it resembles solanine, and forms a loose, dull white mass of silky lustre, which dissolves abundantly in æther and in alcohol, but not perceptibly in water. The alcoholic solution has neither acid nor alkaline reaction. The taste of this hydrate is peculiar; it resembles that of a rancid fat oil, with a slightly scratching after-taste. The crystals melt far below the fusing point of wax, giving off water, to a colourless, almost transparent mass of the consistence of turpentine, which solidifies on cooling to a dull non-transparent crystalline substance, resembling the crystallized hydrated malic acid. On being subjected to greater heat it becomes brown, and decomposes gradually with evolution of vapours, which smell perfectly like those disengaged in the pyrochemical decomposition of rape oil; on bringing it to the light it burns with a bright-red sooty flame, leaving behind a slight carbonaceous residue, which is easily consumed entirely.

When concentrated sulphuric acid is added to the crystalline compound, the crystals dissolve at first with a brownish yellow turbidness; but the solution soon becomes clear, and deposits after a few minutes a grayish white flocculent precipitate, and smells strongly of baldrianic acid.

Nitric acid of 1·25 spec. grav. appears at the usual temperature only to deprive the compound of water; the crystals soon disappear, and a colourless oil collects on the surface of the fluid; subsequently however the mixture becomes turbid, and smells then likewise of baldrianic acid, although weaker than when treated with sulphuric acid. On boiling this mixture nitrous acid is disengaged, the smell of baldrianic acid becomes stronger, and a yellow compound, inso-



luble in water, and possessing the smell peculiar to animal fats when oxidized with nitric acid, is formed.

Phosphoric acid, even when concentrated, has no perceptible action on the compound at the common temperature; heated in the water-bath, the crystals melt, the mixture smells like rancid oil, but on cooling becomes nearly void of smell.

Iodine colours the crystals immediately yellowish brown, and on long-continued action a dark brownish red viscid mass is formed, which smells of iodine and of baldrianic acid. When the compound is placed on a watch-glass under a bell-glass along with iodine, it absorbs greedily the vapours of iodine, becomes at first brownish yellow, subsequently reddish brown, and finally tenacious and almost black. The liquid soon solidifies again, and then smells very strongly of baldrianic acid and but slightly of iodine.

From this behaviour of the compound, especially towards sulphuric acid, it seemed probably to consist of baldrianic acid and some basic compound, forming a neutral salt of baldrianic acid. Experiments were made to separate the baldrianic acid by means of dilute sulphuric acid. 10 grs. of the crystalline compound were submitted to distillation, with the same quantity in weight of sulphuric acid, previously diluted with 5 times its quantity in weight of water, till 25 grs. had passed over. The product was perfectly indifferent towards litmus and rhubarb paper, and also towards nitrate of silver, nor had it the least smell of baldrianic acid; when, on the contrary, the mixture of the compound with concentrated sulphuric acid was left undisturbed for some time excluded from the atmosphere, and then submitted with a little water to distillation, a small amount of baldrianic acid could be detected in the product, both by the smell and by chemical means. It is evident therefore from this, and also from its behaviour towards phosphoric acid, that this new compound cannot be regarded as a salt of baldrianic acid, but must be viewed as the radical of this acid, containing the elements in some hitherto unknown arrangement. The correctness of this view must however be confirmed by the result of its elementary analysis.—*Buch. Rept.*, xxvii. p. 169.

*On a new Process for Subliming Indigo.* By THOMAS TAYLOR, Esq.  
To W. FRANCIS.

MY DEAR SIR,

I send you, according to promise, some sublimed indigo, together with the process for procuring the same, which is as follows:—Any quantity of indigo is to be reduced to powder, and mixed with about half its weight of plaster of Paris. To these materials so much water is to be added, as will bring the whole to a thin paste. This is to be spread evenly upon an iron plate to the depth of an eighth of an inch, and allowed to remain exposed to the air or to a gentle heat until it is tolerably dry. If the heat of a large spirit-lamp be now applied to the under part of the plate, the indigo begins to smoke, emits a disgusting odour, and in a few minutes is covered



with a dense purple red vapour, which condenses into brilliant flattened prisms or plates of an intense copper colour, forming a thick velvety coating over the surface exposed immediately to heat. When this ceases to appear, the heat is of course to be withdrawn; and when cold the sublimed crystals may be readily lifted or swept off, without in the slightest disturbing the subjacent mass. In this manner I have been able to procure, without any particular care, from 15 to 17 per cent. The operation is exceedingly beautiful to look at, is effected in a very few minutes, and any quantity of materials might be operated upon. For ultimate analysis the sublimed indigo should be previously washed with alcohol or æther. I was led to devise this plan from observing some few years ago, when making some experiments on indigo, which I have not now leisure to prosecute, that if a small mass of indigo be cautiously heated, the crystals attach themselves upon its upper surface. The object of the plaster is of course to prevent the indigo from cracking during drying; and my brother finds it most convenient to spread the mixture in the form of a strip about 2 inches broad, applying the lamp to one extremity, and gradually moving it on as the sublimation proceeds. The heat of an Argand oil lamp is hardly sufficient to form large crystals. Should the indigo catch fire, it must be instantly extinguished by a drop of water let fall upon it.

Mr. Crum obtained about the same quantity per cent., but his process is so exceedingly tedious and uncertain, that I gave it up in despair.

It is perhaps proper to state, that the above method was described for me, at the Mathematical Society, some time ago, by our friend A. White, circumstances having prevented my attending.

Yours sincerely,

91 *Fleet Street*, Dec. 14th, 1842.

THOMAS TAYLOR.

*On the Melting Point of Dimorphous Bodies.* By PROF. WÖHLER.

The curious behaviour of lithofellinic acid\*, its possessing two different melting points in its amorphous and crystalline state, induced the author to submit other bodies to examination in this respect. He deduces from the results of his inquiries the following general proposition, that every dimorphous body has also two melting points. Sugar, amygdaline, sylvic acid, and lithofellinic acid, all of which crystallize in well-defined forms, solidify after melting to transparent vitreous masses, without ceasing to possess the property of crystallizing. In this amorphous state these bodies have a far lower melting point than when crystallized.

	Crystallized melts at	Amorphous melts between
Sugar .....	320° Fahr.	194° to 212° Fahr.
Amygdaline.....	392 ...	257 to 266 ...
Sylvic acid .....	284 ...	194 to 230 ...
Lithofellinic acid.....	400 ...	220 to 230 ...

\* See our last Number, page 86.



It is difficult to determine with accuracy the melting point of amorphous bodies, as the actual fluid state is always preceded by a peculiar softening. At the above temperatures the substances were so soft that they might be drawn out into threads. Glass undoubtedly offers the same difference in its melting point in its usual and in its crystalline state (so-called Reaumur's porcelain), and the brown transparent sulphur obtained on sudden cooling evidently belongs to the same class. The melting point of the transparent vitreous arsenious acid is probably lower than the point of sublimation of the crystallized, and the fusibility of the latter probably depends on its previously becoming amorphous at a certain temperature.—*Gött. Gelehr. Anz.* 1841, No. 179.

#### *Preparation and Composition of Pepsine.*

In order to prepare pepsine in quantity, M. Vogel, jun. employs the following process:—The glandular skin of the fresh stomach of the hog was separated from the serous part, and after being cut into small pieces it was treated with cold distilled water; after twenty-four hours' immersion, the water was poured off and fresh portions added. This operation was repeated during several days, until a putrid odour was perceptible. The aqueous infusion thus obtained was precipitated by acetate of lead, the white flocculent precipitate formed containing the pepsine mixed with much albumen; this precipitate being diffused through water, it was decomposed by hydrosulphuric acid gas. When the liquor is filtered, the solution contains pepsine and sulphuric acid, while coagulated albumen and sulphuret of lead remain on the filter. A very small quantity of hydrochloric acid, added to the solution of pepsine and acetic acid, is sufficient to render it capable of artificial digestion.

In order to procure solid pepsine, the filtered liquor must be evaporated to a syrupy consistence, carefully avoiding ebullition, and afterwards adding absolute alcohol to it. After some time a whitish bulky precipitate is formed, which is to be dried by exposure to the air; and it is then a yellowish viscid mass of a peculiar animal odour and a disagreeable taste. Pepsine thus obtained has an acid reaction, because it always contains a small quantity of acetic acid, to deprive it of which various processes were tried, and that which succeeded was heating it in a salt-water bath for some hours, by which a white powder soluble in water and possessing no acid reaction was obtained. It is to be remembered that pepsine loses some of its power of assisting digestion by the action of a high temperature, but as it is not at the same time altered in its chemical constitution, M. Vogel employed it for analysis; the mean of several experiments gave

Hydrogen .....	5·666
Carbon .....	57·718
Oxygen.....	16·064
Azote .....	21·088
	<hr/> 100·536

M. Vogel remarks, that the results of this analysis show that pepsine



is not identical with modified albumen, as has been supposed; he further states that the action of pepsine in digestion may be compared to that of diastase, which changes fecula into grape sugar, without itself undergoing any alteration; this opinion was supported by the fact, that of two grains of pepsine which had acted upon dressed beef so as completely to dissolve it, 1.98 grain was recovered.

The pepsine of the sheep possessed only in a slight degree the power of favouring digestion.—*Journ. de Pharm. et de Chim.*, Oct. 1842, and *Philosophical Magazine*, Dec. 1842.

*On the Action of Water upon the Sulphurets of the Alkaline Metals, and on Haloid Salts. By H. ROSE.*

Do the sulphurets of the alkaline metals decompose water during their solution in this liquid? This question is more difficult to decide than with respect to the sulphurets of the metals of the alkaline earths. If however they do not dissolve in water without decomposition, this must be effected in a manner different from what has been hitherto admitted; hydrosulphurets of the alkalies are not formed, but a sulphuret and free alkali. It is not possible to prove by direct experiment that this is really the case, since both these bodies are equally soluble in water and in alcohol.

Some properties of the solution of the sulphuret of potassium can alone lead to the conclusion, that they decompose when treated with water. Such is the alkaline action of this solution towards litmus paper, which the chloride, bromide, and iodide of potassium do not offer; such also is the fact announced by M. Berthier, that the protosulphuret of potassium exhibits a remarkable evolution of heat during its solution in water.

With regard to the combinations of fluorine, it cannot be denied that this body is almost as capable of forming combinations, which might be called fluo-salts, as sulphur sulpho-salts. The fluoride of silicon, fluoride of boron, and other strongly electro-negative compounds, form with some basic metallic fluorides such numerous and well-defined crystallizable salts, that the same variety may be found in them which is met with in the combinations of the strongly electro-negative sulphurets with basic metallic sulphurets. To M. Berzelius we are indebted for the preparation and the profound investigation of the most important combinations of these two great classes of salts, the sulpho-salts, and those which may be called fluo-salts. It is only the great resemblance which the combinations of fluorine and chlorine offer in other respects, which induced him to consider those combinations which might be called fluo-salts as double haloid salts.

In the same way that the sulphurets of the alkaline metals form sulphurets with sulphuretted hydrogen, the fluorides of alkaline metals combine with fluoruretted hydrogen; but during the solution of the fluorides of the alkaline metals in water, do these decompose into similar combinations and into alkali? This is certainly difficult to decide, because if it were really thus an alkaline metallic fluoride



would very easily form again. All the experiments which I have made prove decidedly that it is not possible to obtain these combinations with the fluoride of potassium by solution in water. Some properties pointed out by M. Berzelius relative to the alkaline metallic fluorides, can alone lead us to the supposition, still however very remote, that they are nevertheless capable of undergoing, under certain circumstances, the decomposition before mentioned. Such, besides the alkaline action of the solution of fluoride of potassium, is its property of strongly attacking glass; such also is the easy decomposition on evaporation of the dissolved fluoride of ammonium into ammonia, which volatilizes, and into a compound of fluoride of ammonium and fluoruretted hydrogen.

The decomposition of water by the alkaline metallic fluorides during solution can as yet only be adduced as a very remote and bold hypothesis; but should it be confirmed, they would decompose water in the same way as the sulphurets of the metals of alkaline earths, a decomposition which takes place in a quite different manner than has been admitted up to the present time, and which is determined by the tendency of these combinations to form sulpho-salts and fluo-salts.

We do not find a similar tendency in the metallic chlorides; the action of water on these does not produce combinations similar to those formed by the soluble metallic sulphurets, and which might also be generated by fluorides of the same nature. With regard to the action of water on the metallic chlorides, the only question is to know whether they dissolve without decomposition, or whether they are converted into hydrochlorates.

The dispute on this subject is as old as the view put forth by Davy and by MM. Gay-Lussac and Thénard, that chlorine is a simple body; but it has not been completely decided in favour of any opinion.

The most zealous partisans of the view that the combinations of chlorine dissolve without decomposition in water, must themselves agree that this is not the case with all. All chemists certainly admit that the volatile chlorides, such as those of phosphorus, of boron, and of silicon, decompose water and form an oxy-acid and hydrochloric acid.

Although the fact has not been positively asserted, nor rigorous limits traced, it is generally admitted that all chlorides which answer to energetic oxides and form acids, decompose water during their solution in this liquid. The dispute therefore only turns upon the metallic chlorides which correspond to basic oxides.

The volatile chlorides mentioned, even when in a solid state, such as the solid chloride of phosphorus corresponding to phosphoric acid, produce a very considerable elevation of temperature in their decomposition by water. In some cases, which are however rare, the elevation of temperature might be attributed, but in part only, to the circumstance, that a small number of these chlorides of a fluid nature form a solid hydrate with a small quantity of water; such is the case with the chloride of tin; but amongst the greater



part of the other volatile and fluid chlorides, we do not know of a similar solid hydrate, and none exists.

This elevation of temperature can then only be attributed to the elements of the above chlorides forming combinations with those of water. Every chemical combination is accompanied with heat, and the elevation of temperature is then so much the more considerable. The elevation of temperature is sufficiently strong to render it impossible to detect, in the decomposition of the solid chloride of phosphorus by water, the cooling which the passing of a solid body into a liquid state must necessarily produce.

If then an elevation of temperature is evident during the solution of a metallic chloride in water, it may be concluded that the elements of the latter have decomposed it, and that it has formed other chemical combinations. This is especially the case when the metallic chloride is in a solid state.

If, on the contrary, a lowering of temperature is perceptible during the solution of a solid metallic chloride in water, it results from no chemical combinations being formed in this case. The water at least has not then been decomposed; the combination which is formed by the simple solution is in every case so feeble, that if it really produced an elevation of temperature, this is disguised by the cooling which arises from the passage of a solid body into a liquid state.

The chlorides of potassium, of sodium, and of ammonium, dissolve in water and produce cold; we may justly conclude therefore that these metallic chlorides are not capable of decomposing water. But here a circumstance also takes place which renders the application of this method, if not impossible, at least difficult. A very great number of solid metallic chlorides, which are certainly not able to decompose water, frequently develop much heat in their solution—for example, the chloride of calcium; and MM. Thénard and Gay-Lussac attach importance to this circumstance, inasmuch as they admit the decomposition of this salt by water as being demonstrated by this fact. But in this case it is only the metallic chlorides which combine with water of crystallization, and the elevation of temperature arises from the absorption of this latter, which passes from a liquid into a solid state, consequently from the same cause which makes the anhydrous oxysalts develop heat when they take up any water of crystallization.

The anhydrous metallic chlorides, which lower the temperature when they dissolve, share this peculiarity with the oxysalts, which like the first are not in a condition to combine with water of crystallization. I have verified a production of cold in the solution of the sulphate of potash, of the sulphate of the oxide of ammonium, of the chlorate of potash, of the neutral chromate and of the bichromate of potash, of the nitrate of lead, of the nitrate of soda, and of the nitrate of potash.

There is however a remarkable difference in the solution of these salts. Those first mentioned only produce a lowering of temperature of a few degrees, whilst in the solution of the nitrate of soda



and of the nitrate of potash the decrease which occurs is very considerable. The greater or less solubility in water may be in part the cause of this difference; but it is not that alone, since it is precisely the chlorate of potash which produces a more considerable lowering of temperature than the sulphate of the oxide of ammonium and the chromate of potash, although these latter salts are more soluble at the ordinary temperature than the former.

There is a similar but still more marked difference with the anhydrous metallic chlorides; but perhaps we may find an explanation of the anomaly mentioned in the way in which these chlorides behave during their solution in water. Of all the salts which I have had occasion to examine, it is the chloride of ammonium which produces the most intense cold. The chloride of potassium also occasions a very great decrease of temperature, although much less than the chloride of ammonium. This lowering is, on the other hand, very feeble during the solution of the chloride of sodium. The reason of this phenomenon evidently is, that the chloride of sodium may doubtlessly take up water of crystallization under certain circumstances. We know that it crystallizes at a low temperature with 4 atoms of water, but that the affinity of the chloride of sodium for water of crystallization is so feeble, that the hydrated salt can only exist at a low temperature; nevertheless this affinity for water of crystallization, feeble as it may be, is the cause that only a slight refrigeration is produced instead of the considerable lowering of temperature which the solution of the chloride of sodium would produce, if, like the chloride of ammonium, it could not combine with water of crystallization.

If a salt which we only know in the anhydrous state occasion but a feeble lowering of temperature, especially if it be very soluble, we have reason to presume that nevertheless it has a certain affinity for a definite quantity of water, and that it might crystallize in the hydrated state under circumstances that we have not been able to produce up to the present time.

The anhydrous oxysalts behave towards water exactly as other salts which have taken up the whole quantity of water with which they can combine. They present a decrease of temperature, whilst if they are treated with water in the anhydrous state, they produce heat. Thus the carbonate of soda dissolves in water, with refrigeration if crystallized, and with elevation of temperature if anhydrous.

The metallic chlorides which do not decompose water greatly resemble the oxysalts of corresponding composition; they also offer a lowering of temperature during their solution in water, when combined with water of crystallization. The crystallized chloride of calcium develops some cold during its solution, whilst it occasions much heat when anhydrous.

This great analogy between the oxysalts and the corresponding metallic chlorides, in the anhydrous as well as in the hydrated state, is worthy of remark. It might also induce us to prefer the known opinion of Davy and of Dulong, relative to the composition of the oxysalts, to that admitted until the present time, an opinion which



nevertheless has gained in probability from the researches of Mr. Daniell.

Amongst the combinations of chlorine which decompose water during solution, there are some which, as I have before said, may combine with water in order to form a solid hydrate; such, for example, is the chloride of tin. If we dissolve the hydrate of this salt in water, it occasions a lowering of temperature, whilst, as we know, a considerable heat is produced on dissolving anhydrous chloride of tin. This is a proof that the hydrate is formed of a hydrochlorate of the oxide.

Strict limits may be traced between the metallic chlorides which decompose water and those which have not this property; thus the salts of certain oxides, such as those of antimony and of bismuth, as also those of the deutoxide of mercury, are, as every one knows, decomposed by water; sometimes a basic salt is separated, sometimes pure oxide. This peculiarity evidently arises from the water in these cases acting the part of a base and eliminating the oxides, from their being feebler bases than water, at least towards certain acids.

The combinations of chlorine with antimony and bismuth, whose composition is analogous to that of the oxides of these two metals, behave in the same manner as the corresponding oxysalts towards water. A natural consequence arising from this fact is, that the water first transforms them into hydrochloric acid and into oxide, and a greater quantity of water separates the latter. In short, these chlorides also belong to those which, notwithstanding their solid condition, produce considerable development of heat when treated with water.

The salts of the deutoxide of mercury, as well as those of antimony and of bismuth, are decomposed by water; but the chloride whose composition is analogous to that of the deutoxide of mercury, neither affords any precipitate of oxide, nor forms a basic salt, even when heat is applied. Now the chloride of mercury is not decomposed by water; and it is at the same time incapable of combining with water of crystallization. It produces therefore a lowering of temperature, though feeble, by reason of its small degree of solubility in cold water. Considerations similar to those which I have mentioned, relative to the action of water on the metallic chlorides, may be applied to the bromides and to the iodides, as well as to the cyanides, and even to the metallic sulphocyanurets when they are treated by water. Those of the combinations whose composition corresponds to that of the basic oxides, dissolve in water without decomposition; they too, when they cannot take up water of crystallization, produce a diminution of temperature during solution, like the corresponding combinations of chlorine. I have observed it during the solution of the bromide and of the iodide of potassium, as well as during that of the sulphocyanuret of the same metal, and even of the cyanide, which consequently dissolves in water without decomposition.

If this last body decompose with so much facility at a later



period, it is a fact independent of the considerations which now occupy us.

On the other hand, the melted fluoride of potassium dissolves in water with an elevation of temperature. Nevertheless, in seeking the reason of this phenomenon, I found that this body combines with water of crystallization, and can crystallize with 4 atoms of the latter.

The remarkable development of heat shown, according to M. Berthier, by the sulphuret of potassium during its solution in water, is, as I have already said, a proof of its decomposition by water, since we know of no combination of the sulphuret of potassium, with water of crystallization, as may exist, according to M. Berzelius, for the sulphuret of sodium. The sulphuret of barium also presents a considerable elevation of temperature when treated with a small quantity of water. But in this case some hydrated sulphuret of barium is formed, which a greater quantity of water decomposes.—Poggendorff's *Annalen*, vol. iv. p. 533.

*On the Urine in morbus Brightii.* By Dr. SCHEERER.

The author had frequently occasion to examine the urine of a patient, whose dropsy, as was subsequently proved by dissection, was owing to a granular degeneration of the kidneys.

When first examined the urine was neutral, and milky from mucus of the bladder and globules of elaine; it coagulated on being heated, and contained in a thousand parts 4·7 of albumen, only 3·2 of urea, with but little uric acid and salts. After the use of *Squills* and *Digitalis* for several days, the urine did not increase in quantity, but was more easily decomposed, so that even after 24 hours it contained much carbonate of ammonia, and when heated coagulated only on the addition of acetic acid, in consequence of a caseous modification of the albumen. When immediately filtered from the mucus of the bladder, it preserved longer, and coagulated by heat alone. This facility of decomposition of the urine soon ceased, and it subsequently passed into an unusual state of stability. The use of the *Elect. antihydrop.* increased the amount of urine, but did not effect its composition. Subsequently *Acetum Scillæ* saturated with carbonate of potash was administered, the effect of which was to render the albumen less coagulable by the alkali passing into the urine; its quantity however was not diminished, while that of urea, uric acid and the lactates was slightly increased. On employing the *Ol. copaivæ æthereum*, the amount of urine was increased, the quantity of urea continued the same, that of albumen rose to 6·8 in a thousand parts, the uric acid also increased, and the urine was somewhat acid. *Digitalis*, *squills* and *opium* were now administered; the urine became darker, the amount of albumen decreased to 4·2, the urea increased to 4·3 in a thousand parts. At this period the dropsy had diminished, but it subsequently again increased, and the disease continued to progress; the secretion of urine becoming less and less; some days previous to death the urine contained 5·7 albumen and



4·9 urea. The urine found in the bladder 24 hours after death contained in a thousand parts 13 albumen and very little urea.

The blood contained no urea, but some carbonate of ammonia. The serous fluid of the cellular tissue of the arm coagulated but slightly on being heated, more strongly when acetic acid was added. The serous fluid of the abdomen contained 10·5 albumen, little carbonate of ammonia, which was the case also with the fluid of the heart; in both these fluids only traces of urea could be detected. The fluid which for some time previous to death was discharged in watery evacuations from the intestines, contained neither albumen nor urea, but much carbonate of ammonia.—*Ann. der Chem. und Pharm.*, xlii. p. 188.

### *Hydrate of the Neutral Chromate of Lead.*

According to Anthon, when solutions of equal equivalents of sugar of lead and neutral chromate of potash are mixed hot, the yellow precipitateedulcorated and dried, it is anhydrous; when, on the contrary, at the ordinary temperature, the precipitate is of a paler yellow, and contains when dried 5·2 per cent., or 1 equivalent of water.—*Buch. Rept.*, xxvi. p. 129.

## ANALYTICAL CHEMISTRY.

*On the Use of Sulphurous and Nitrous Acids in Analysis.* By  
M. WACKENRODER.

*Sulphurous Acid.*—From the great tendency of this acid to combine with more oxygen in order to form sulphuric acid, it is able to deprive chloric, bromic, iodic, selenious, and osmic acids so completely of their oxygen, that even the radicals of these acids are reduced. Chloric and bromic acids however are only decomposed when in the free state; when combined with bases, reduction results only when sulphuric acid has been added. Iodic acid, on the contrary, undergoes reduction even in its salts; but an excess of the sulphurous acid quickly redissolves the iodine, hydriodic and sulphuric acids being formed. The formation of this hydracid is evident from the iodine being again reduced by a sufficient quantity of nitric acid, and its imparting then to amyllum the well-known blue colour. Selenium is reduced from the selenious acid with the aid of heat and the presence of nitrous acid; osmic acid is reduced under precisely similar circumstances. In all these operations the blue colouring of the liquid, usual in such reductions, is strong and characteristic.

The other metallic acids which are soluble in water are only deoxidized by sulphurous acid. The alkaline manganates and permanganates immediately afford, on being mixed with sulphurous acid, a precipitate of hyperoxide, or rather of the oxide of manganese. The alkaline chromates are converted by means of sulphurous acid



into sulphates and the sulphate of the oxide of chromium. Even in the cold, and without any addition of sulphuric or hydrochloric acid, the liquid assumes an emerald green colour. The alkaline salts of vanadium are said to undergo the same change\*. Arsenic acid is immediately reduced on boiling with sulphurous acid to arsenious acid; the boiled liquid is instantaneously coloured yellow by sulphuretted hydrogen, and affords, on the addition of hydrochloric acid, a precipitate of sulphuret of arsenic. The use of sulphurous acid is generally resorted to in German laboratories previous to precipitation of the arsenic by means of sulphuretted hydrogen; and in all cases of poisoning, where the arsenic, from the employment of chlorine, &c., has been obtained in the state of arsenic acid, its use is absolutely necessary. It is therefore important to ascertain whether the sulphurous acid does not sometimes contain arsenic; and Wackenroder has shown that the arsenious acid which frequently impurifies the sulphuric acid of commerce, passes over along with the vapours of the sulphurous acid, when this is prepared by boiling copper foil or mercury with sulphuric acid, and even in the other methods, as for instance with charcoal. The sulphuric acid should consequently be tested for arsenic previous to its employment. The other oxyacids, as hyperchloric, selenic, sulphuric, and phosphoric, undergo no decomposition by sulphurous acid. The oxidizing action of nitrous acid on sulphurous acid is very slight when the liquid is dilute, and this is more so the case with nitric acid. The liquid must be somewhat concentrated, and must be heated to effect decomposition.

Sulphurous acid also reduces by giving off oxygen; such, for instance, is the case with regard to its action on sulphuretted and phosphuretted hydrogen, and probably on seleniuretted hydrogen. Sulphurous acid and sulphuretted hydrogen are very sensitive tests the one for the other. It is obvious therefore that the colourless solution of the alkaline sulphuret should afford a white opacity with sulphurous acid. The hydracids of chlorine, bromine, and iodine, as also the chlorides, bromides, and iodides, undergo no reduction by sulphurous acid; for these elements are converted by this acid and the presence of water into hydracids, sulphuric acid being formed.

*Nitrous Acid.*—This acid, especially the mixture of nitrous and nitric, as contained in the fuming nitric acid, is, as is well known, a powerful oxidizing agent. Its reductive action however is in many respects far more interesting, as it results in general from an actual process of oxidation. By the absorption of oxygen it deoxidizes some metallic acids, and also the hyperoxides of some metals. Thus manganic, hypermanganic, vanadic, and chromic acids are deoxidized, in consequence of which nitrate salts are formed. With respect to chromic acid, this change only occurs when the alkaline chromates are somewhat concentrated and are boiled with nitrous acid.

\* We can also state the same of the salts of molybdic acid with the alkalies; the colour is here blue.—W. F.



Arsenic acid is not perceptibly affected by moderate heating with this acid; it appears probable however that deoxidation might be effected by the long-continued action of the nitrous vapours. The chloric, bromic, and iodic acids are likewise reduced by affording oxygen to the nitrous acid. The chlorate must be dissolved in a little water, and heated with the fuming nitric acid; the liquid then contains free chlorine, and therefore dissolves gold, renders solution of silver milky, and bleaches litmus, &c. Bromine is easily and completely reduced from the bromates; it colours the nitric acid yellowish red. The reduction of iodine from the free or combined iodic acid is but weak, and amylum is not coloured to such an extent as in other reductions of iodine. When a large excess of the fuming nitric acid is employed, the separated iodine is reoxidized, and the amylum, which had become blue again, rendered colourless. It is therefore advisable, when reducing iodine, in examining any substance for it, to employ a colourless and not very concentrated nitric acid. When a little sulphurous acid is added to the liquid, which has previously been mixed with excess of fuming nitric acid, the amylum is rendered intensely blue; but it is often not easy to attain the point when a small quantity of iodine is reduced in order that the amylum remain distinctly blue.

The halogens are reduced in the hydracids and in the haloid salts, in consequence of an oxidation of the hydrogen or of the metals by the fuming nitric acid; however the ease and rapidity with which the reduction ensues varies, while even small quantities of sulphuretted hydrogen or of the alkaline sulphurets are immediately detected by the quickly ensuing milky turbidness; hydrochloric acid and the chlorides are only decomposed when the liquids are concentrated, or if in a dilute state, are boiled for some time with the fuming acid. The reduction of bromine and of iodine from their combinations with hydrogen or with the metals, is accompanied by very different appearances. Iodine is more easily and rapidly reduced by the fuming acid than by the usual colourless acid; but it may so happen, as above mentioned, that the whole of the separated iodine is redissolved. In these compounds of iodine therefore the colourless nitric acid is preferable, as it has no action on the reduced iodine. Bromine, as usual, stands between chlorine and iodine. The bromide of potassium, when diluted to a certain extent, is no longer reduced by the fuming acid; and yet when concentrated sulphuric acid is likewise added, the amylum assumes a very deep and permanent yellowish red colour. It is not unimportant to know, that in this case the yellow colour of the compound of bromine with amylum is not at all affected by the presence of small quantities of iodine. If the quantity of iodide of potassium be increased, there is a time when the blue colour of the iodide of amylum becomes purple red from the presence of bromine, in the same manner as it becomes dark brown by the gradual liberation of chlorine. When iodine is in larger proportion, the blue colour of the iodide of amylum is constant, and conceals the weaker yellowish red of the bromide of amylum entirely.—*Archiv der Pharm.*, xxxi. p. 74.



*Test for Phosphorous Acid.*

According to Wöhler, phosphorous acid is converted on being heated with sulphurous acid into phosphoric acid, sulphuretted hydrogen being formed and sulphur separated. In this manner phosphorous acid may easily be detected in phosphoric acid; when arsenious acid is present at the same time, the sulphuret of arsenic is immediately formed on treatment with sulphurous acid. An amount of phosphorous acid in phosphoric acid may also be detected by Marsh's apparatus from the phosphuretted hydrogen which is disengaged. The gas burns with a whitish lucent flame, and when let burn close to a surface of porcelain, a ring of green light is observed in the expanded flame similar to that afforded by phosphor when burnt in chlorine gas, or with insufficient presence of atmosphere.—*Ann. der Chem. und Pharm.*, xxix. 252.

*Sulphurous Acid for determining Iodine and Copper.*

When a solution of the black oxide of copper is added to a liquid containing iodides, a part is precipitated as protiodide of copper, and a portion of iodine is set free. This latter portion of iodine is also thrown down if a solution of protoxide of iron be added at the sametime. The iodide of copper is however thus impurified with iron, and M. Sarphati therefore recommends a solution of the perchloride of copper in dilute hydrochloric acid. When however chlorine has to be avoided, this method cannot be applied. According to Duflos, the same object is completely attained on employing a solution of sulphate of copper in a concentrated solution of sulphurous acid in water. The whole amount of iodine is then precipitated as protiodide of copper.—*Ann. der Chem. und Pharm.*, xxxix. p. 254.

## PHARMACOLOGY.

*Pharmacological Notices from Trieste. By H. CREDNER.*

YELLOW sulphuret of arsenic (Orpiment) is brought from Persia by caravans over Damascus and Aleppo to Beyrout, from whence it proceeds to Leghorn, which is in great commercial intercourse with Beyrout, and so finds its way into European commerce. Some times supplies are brought to Constantinople, and thence generally pass through Trieste on their further circulation. A good orpiment must have a laminar fracture, be of a beautiful gold yellow lustre, and free from the red sulphuret (realgar). Small quantities of this article sometimes find their way into commerce from Hungary and Russia. This is generally very inferior, and is frequently mixed with realgar.

Two sorts of *Colocynths* are imported here, Egyptian and Cyprian. The first kind is recommended by its large, light, beautiful white



fruit, while the Cyprian colocynths are smaller, more pithy, and characterized by a yellowish colour.

*Folia Sennæ*.—The senna from Alexandria and from Tripoli is sufficiently known. The first kind is brought from Cairo by way of Alexandria into European commerce; and as a Greek house of this town had obtained for some years, by contract from Mehemet Ali, the annual produce of the senna-crop, Trieste became the only place in Europe from whence all the druggists had to draw their supplies of Alexandrian senna. This contract ceased this year (1842). As Leghorn has a great trade with the African states, this is the place to procure the Tripolitan senna. Seldom are any direct supplies brought to Trieste. Aleppo senna is less known, parcels of which at times arrive here by Smyrna and Beyrout. The greater portion of this senna consists of *Cassia acutifolia*\*; sometimes however bales occur which contain only broad, short, or blunt leaflets (probably therefore *Cassia senna*? *C. obovata*). Although this Aleppo senna is the most rare in commerce, it is the most interesting, for it frequently arrives in its perfectly natural state; so that at times entire branches, with their leaflets, flowers and legumes, are found in it, which is never the case in any of the other kinds. This Aleppo senna, which is comparatively very cheap, appears likewise to find its way into Egypt, as the Alexandrian senna frequently contains some of it intermixed. Martius mentions in his 'Pharmacology,' a *Senna de Tennavella*; this is probably the Tinnevelly senna, which occurs as the dearest of all the kinds of senna in the London market, and is recommended by its beautiful unmixed leaflet. In the London lists of prices it is always named East Indian Tinnevelly; but it is a question, whether this kind, which is every day becoming more and more the favourite in Germany, be not derived from some of the countries situated on the Persian Gulph obtained by barter into the East Indies, and imported from thence to England†. East Indian senna is on the whole little used here.

*Nut-galls*.—The following three kinds occur in commerce—Aleppo galls, Smyrna galls, and East Indian galls. These three kinds consist, according to the ripeness of the apples, of black, green and white galls. When the galls occur mixed in commerce they are termed 'natural;' they are sorted into the following kinds:—picked black, natural black (consisting of black and dark green galls), dark green, light green, natural white (light green and white galls), and picked white. The Aleppo galls are the best; but under this name must not be supposed such only as come from Aleppo; this kind is derived from the neighbourhood of Mosul in Natalia, and it is therefore called in the Constantinople and Smyrna lists, not Aleppo, but Mosul galls. This gall recommends itself by its heaviness, and the lighter-coloured kinds (white and light green galls) are frequently remarkable from their large size; but the best distinguishing

\* Dr. Pereira, in his 'Materia Medica,' states it to consist of the leaflets of *C. obovata*.—Page 1602.

† Dr. Pereira states, in his 'Materia Medica,' vol. ii. p. 1603, that it is cultivated by Mr. G. Hughes at Tinnevelly, in the southern part of India.—Ed.



character between the Mosul and Smyrna galls, is the darker kind of the Mosul galls having as it were a bluish bloom, while the Smyrna are of a grayish colour. The Mosul gall moreover has not so many tubercles as the Smyrna kind. The first is exported from Constantinople and Smyrna, the latter principally from Smyrna. The chief market-places are Trieste, Leghorn, Marseilles and London, which import them direct. The fourth kind of nut-gall is the marmorated one which is brought from Puglia; the chief staple places are Naples and Trieste. It consists generally of large apples, but has fewer tubercles, and these are not acute. They are generally of a whitish red and greenish colour, sometimes also darker. Istria produces a very inferior kind of galls; they are small, and usually of a reddish colour, which however is subject to much variation, and are much tuberculated. Place of export, Trieste. These are the principal kinds, not to mention others of rare occurrence; for instance, a kind of gall is brought from Asia Minor and Dalmatia, which is hollow, not heavy, and of a reddish colour.

*Opium*.—Works on pharmacology frequently make mention of a Constantinople opium distinct from the Smyrna opium. Till within a few years opium was a monopoly in Turkey, and the finest cakes of Smyrna opium were forwarded by the authorities of the district to Constantinople, and then came into commerce under the name of Constantinople opium. The distinction is still kept, the well-formed small cakes being sold as Constantinople opium. Both the Smyrna and also the Egyptian opium, when brought to Trieste frequently contain cakes, which have nothing but the name in common with opium, or at least contain so much foreign admixture that they are thrown aside.

With regard to the mode of packing the various articles mentioned, it may be observed that the orpiment comes in chests of from 200 to 300 lbs. weight; Alexandrian senna in bales of from 400 to 500 lbs. (the covering of the bales is coarse linen); the Tripolitan senna in bales of netted reeds of about 300 lbs.; the Aleppo senna in bales resembling the Alexandrian. The nut-galls and colocynths are generally sent in casks with iron hoops; the casks with galls containing about 250 to 300 lbs.; the colocynths in much larger vessels. Large quantities of galls are likewise imported in bales. The mode of packing the unpeeled colocynths is interesting. They are imported in so-called *caraffi*, *i. e.* square baskets constructed of the ribs of the leaves of the date-palm. As the pieces are about four fingers apart, the colocynths are held together by a sack within the basket. The chest of opium is inclosed in tin cases of from 110 to 120 lbs., which are packed in larger wooden chests.—*Archiv der Pharm.*, xxv. p. 90.

### *Niepa Bark.*

This bark, which is derived from Batavia, and is said to possess antifebrile properties, is 3 lin. in thickness, of a reddish brown colour, with nearly smooth epidermis, of dense white punctated



tissue, brittle, of a somewhat acrid and styptic taste ; it imparts to the saliva a red colour, and is also said to be used in dyeing red. According to Virey, it is the bark of the Malpighiaceae plant described by Van Reede in the 'Hort. Malabar.' as *Karin-njotti*, which Lamarck calls *Viola pentapetala*, and the fruit of which Gærtner has represented under the name of *Sumadera*. This bark, and that of *Morinda umbellata*, afford the red dye for the Indian foulards.—*Journ. de Pharm.* 1839, p. 221.

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## CHEMICAL PREPARATIONS.

### *Pharmaceutical Observations on the Syrup of the Iodide of Iron.*

THE following is the method recommended by Dr. Geiseler for preparing this syrup:—Instead of finely pulverized metallic iron, he employs common pure iron filings ; and as these, in the proportion of 1 part iron to 3 of iodine, are only slowly acted on, he brings equal parts of iron and iodine into contact by means of water. When 3 drachms iodine and as many of iron filings are brought into a glass with 6 drachms distilled water, a nearly colourless slightly green tinged fluid is obtained in a few minutes, which is immediately conveyed on to a filter, and the residueedulcorated with so much water that the weight of the whole of the liquid amounts to 12 drachms. Shaken with 18 drachms of pulverized pure white sugar, it forms a syrup, which at first has the appearance and consistence of syrup of almonds, but subsequently becomes as clear and colourless as *Syrupus simplex*, possessing but a scarcely perceptible greenish tint. Each drachm contains 6 drachms of iodine, or rather the quantity of protiodide of iron corresponding to this, viz. 7.288 grains. The advantages of this mode of preparation consist, first, in the combination of the iodine with the iron being effected rapidly ; secondly, the application of heat being rendered unnecessary, whereby the stability is increased ; and, thirdly, the preparation of a dilute syrup of iodide of iron, which contains in the ounce only 3 grains of iodine, or 3.644 iodide of iron, which may be executed with sufficient accuracy by mixing half a drachm of the concentrated syrup with  $7\frac{1}{2}$  drachms *Syrup. simplex*.

As soon as the concentrated syrup of the iodide of iron begins to acquire a yellowish brown colour (frequently the syrup, in the preparation of which heat has been applied, does this directly), it contains traces of the periodide. These cannot be detected by means of ferrocyanide of potassium, as the tint of the blue colour produced deceives ; but a solution of amylum is in this case a very sensitive test, as it is not at all coloured by the protiodide, but becomes immediately of a dark or light violet, according to the larger or smaller amount of the periodide of iron. The following test is as accurate :—1 drop of tincture of galls is mixed with 2 drachms of distilled water, and 1 drop of the solution of the iodide of iron added to the mixture ; if this produce a perfectly white opacity, which only sub-



sequently becomes blue, then the solution contains no periodide, which is the case if the blue colour was immediately called forth. It is remarkable, that the solution of the protiodide of iron, mixed with sugar, even after much periodide has been formed, does not become opaque, but remains clear, although this formation of the periodide can only be effected by a separation of peroxide of iron. The concentrated syrup of the protiodide, prepared cold, remains unchanged for about 14 days; it then begins to assume a yellowish tinge, and colours solution of amyllum faintly violet. Gum-arabic prevents, almost as well as sugar, the conversion of the liquid protiodide into the periodide. When the syrup of the iodide of iron is prepared according to the above method, and the liquid amounting to 12 drachms is mixed with a solution of 1 oz. of gum-arabic in 10 drachms distilled water, a syrupy slime is obtained of a faint greenish colour, each drachm of which also contains 6 grains of iodine, and keeps unchanged for several weeks.

It is difficult to obtain a preparation of the protiodide of iron in a solid form, even on mixing with sugar; during evaporation periodide of iron is formed. To prevent this change the author evaporates 1 drachm of the concentrated syrup with half a drachm milk-sugar in a porcelain basin in a water-bath, until the mass taken still warm from the capsule has the consistence of a pill mass. It could not be powdered without further addition, but when so much milk-sugar was added that the total weight amounted to 2 drachms, it could be reduced by continued trituration to a white powder, which might be preserved for months in a well-stoppered glass bottle, without a trace of the periodide of iron being formed. It becomes moist in paper capsules, and brown after some time from the formation of the periodide. Each drachm of the powder contains a quantity of the protiodide of iron corresponding to 3 grs. iodine.

The protiodide of iron may be easily formed into pills in the following manner:—1 drachm of the concentrated syrup or of the slime is warmed in the water-bath with 1 drachm of milk-sugar until the mass has acquired the consistence for pills. The warming must not be continued very long, otherwise the mass becomes too hard. 60 pills are formed from the above-mentioned quantities, each of which contains a quantity of the protiodide of iron corresponding to  $\frac{1}{10}$  gr. of iodine. 1 drachm of the syrup, or 1 drachm of the slime, likewise affords a very good pill mass with 2 drachms of the pulverized root of *Althæa*, which may be formed into 90 pills, each of which contains  $\frac{1}{15}$  gr. iodine. It is unnecessary to observe that both kinds of pills must be preserved in well-stoppered bottles, in which they keep several weeks without undergoing the least change; exposed to the air, they soon alter, and contain periodide of iron.—*Archiv der Pharm.*, xxix. p. 349.

#### *On Syringine.* By M. BERNAYS.

This new, indifferent, crystalline, vegetable substance occurs in the leaves and green branches of *Syringa vulgaris*, and was separated



in the following manner:—The extract, obtained by twice boiling and pressing, was treated with an excess of vinegar of lead, by which very much tannate of lead was precipitated, and the previously dark liquid became nearly colourless. The excess of the lead salt was removed from the filtered liquid by means of sulphuretted hydrogen, and after being again filtered evaporated to a thick syrup. Gummy substances and salts of lime were separated from it by means of alcohol of 0.833 sp. gr., and after being once more filtered and evaporated to the consistence of a syrup, the whole changed after 24 hours' rest into a paste of minute white bright needles, which were collected on white linen, washed with a little water to free them from adherent sugar, and then dried. 2 drachms of syringine were obtained in this manner from 3 lbs of the plant.

Syringine forms a tissue of minute white shining prisms. On crystallizing, a central column is generally first formed, around which subsequently long needles group themselves in a radiate form, presenting a beautiful appearance. It has a peculiar nauseous taste, more sweetish and acrid than bitter; this is however only perceptible when 1 or 2 grs. are brought at once on to the tongue. Syringine is insoluble in æther, easily soluble in from 8 to 10 parts of water and alcohol. Salts of iron produce no change in the solution. Heated in a platinum spoon, it first melts and then burns without leaving any residue. The action of concentrated sulphuric acid upon it is peculiar; it forms a beautiful violet blue solution, which at first frequently appears yellow and green, but very soon passes into blue. The blue liquid becomes on the addition of water bright red amethyst-coloured; on saturating the acid, the blue colour disappears without producing a precipitate.—Buch. *Rept.*, xxiv. p. 348.

#### *Lilacine.*

Probably identical with the above new body is the substance to which the name of Lilacine has been applied by M. Meillet, who prepared it in the following manner from the leaves and green seed-vessels of *Syringa vulgaris*:—The leaves, or still better the green seed-vessels, which contain most lilacine, are pounded, boiled twice with water, the decoct evaporated to half, basic acetate of lead added, concentrated further to a thin syrup, treated with an excess of calcined magnesia, the whole dried, the residue pulverized, which is facilitated by the addition of a small quantity of carbonate of magnesia, the powder digested with water once or twice at 86° to 104° Fahr., and the portion remaining undissolved now treated with boiling alcohol of spec. grav. 0.8295. The alcoholic solution is decolorized with animal charcoal, filtered, evaporated to the half, and placed aside; on cooling, the lilacine crystallizes from it. The object of the addition of basic acetate of lead is to remove a resin which adheres tenaciously to the lilacine; treatment with warm water is to remove the acetate of magnesia and the mannite, which according to the author's observations occurs abundantly in the green fruit of *Syringa*. The author suspects that the lilacine,



although no alkali, occurs in the plant in combination with malic acid.

Lilacine forms minute light fasciculi of acicular crystals, or on spontaneous evaporation of a cold prepared solution, long quadrilateral prisms with acute terminations. It has a purely bitter taste, resembling the salts of quinine, but less intensive; it is insoluble in water and in most acids; it dissolves in acetic acid, but separates unchanged.

Lilacine does not occur in equal quantity in all *Syringæ*; some species do not afford a trace. The substance has not yet been tested as to its therapeutical properties.—*Journ. de Pharm.*, 1842, p. 25.

#### *Tartrate of Potash and Soda.*

This salt is most economically prepared, according to Dr. Mohr, from tartar, potash and cubic nitre (nitrate of soda). The tartar is saturated with the potash, and the requisite quantity of crude nitre added, left to settle, filtered and crystallized. The crystals of nitre are separated mechanically, and the Seignette salt purified by crystallization. 19 parts tartar require about  $8\frac{1}{2}$  of the cubic nitre.—*Buch. Rept.*, xxii. p. 135.

#### *Refining of Liquorice Juice.*

Möhlenbrock recommends the following process:—A layer of straw is placed in the vessel about half a line above the cock; it is then filled with rolls of liquorice, and water poured over them. After 48 hours this is drawn off, and fresh water added, again drawn off after 24 hours, and this repeated until the water passes through nearly colourless. On the whole about  $1\frac{1}{2}$  time the weight of the liquorice juice in water is consumed. The residue, when stirred with water, imparts to it but a very faint colour.—*Buch. Rept.*, xxviii. p. 198.

#### *Preparation of Spiritus Ætheris Nitrici, according to Dr. GEISELER.*

24 oz. of alcohol of 0·840 are mixed with 4 oz. sulphuric acid, left to stand for 8 days, then poured into a retort containing  $4\frac{1}{2}$  oz. of dried nitre; 20 oz. of the liquid are distilled over at a gentle heat, which is then rectified over magnesia. Copper retorts and tinned cooling apparatus may be employed in this mode without any disadvantage. The preparation is pretty constant in its amount of æther. Mixing of nitric æther with alcohol cannot afford an officinal *Spir. nitr. æther.*, as it always contains aldehyd\*. Preservation over magnesia is not practical, as it constantly gives rise to decomposition and formation of nitrite of magnesia.—*Arch. der Pharm.*, xxviii. p. 60.

\* According to Prof. Liebig, this aldehyd is an essential constituent of the officinal nitric æther.—*Ed.*



## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the Manufacture of Oxalic Acid.*

THIS acid, which is the object of considerable chemical manufacture, is either formed by decomposing the bioxalate of potash which occurs in the juice of many plants, for instance in the wood-sorrel, *Oxalis Acetosella*, and several kinds of *Rumex*, or by the oxidation of numerous organic substances with nitric acid. In the first method the acid salt is previously rendered neutral by saturating it with carbonate of potash, and the solution then thrown down with acetate of lead. The well-washed and dried precipitate is digested at a gentle heat with  $37\frac{1}{2}$  per cent. sulphuric acid previously diluted with 10 times its weight of water, the insoluble residue, sulphate of lead, isedulcorated, and the liquids evaporated to crystallization. An addition of about 5 per cent. nitric acid towards the end of the operation is said to assist the crystallization.

The second method, which is that usually followed in this country in manufactories on a large scale, is by oxidation of organic substances, such as sugar, molasses, starch, saw-dust, remnants of woollen-cloth, &c., with nitric acid. As, however, much nitric acid is requisite, this mode becomes somewhat expensive, if the nitrous acid which is given off cannot be made use of in other processes, for instance in the manufacture of sulphuric acid. In England the one process is often connected with the other. From the low price of nitrate of soda and the fact that the manufacturer generally makes his own nitric acid, the price is exceedingly moderate.

The following observations by M. Beringer on the preparation of oxalic acid according to the last method, taken from Buchner's 'Repertorium,' xxiv, p. 24, may prove of interest to many of our readers:—

According to most prescriptions 1 part of sugar is digested with 6 parts dilute nitric acid, of specific gravity from 1.12 to 1.22, and after the first portion of crystals has been removed,  $1\frac{1}{2}$  part more nitric acid added. The produce generally amounts to from 18 to 25 per cent. of the crystalline acid. The acid so prepared, on losing its water of crystallization, does not afford a white powder, but becomes yellow or brown, even although it had been crystallized several times. The cause of this easy decomposition of the oxalic acid is solely due to the small quantity of nitric acid employed; when sugar, starch, &c. are treated at the outset with a larger quantity, especially of a more concentrated acid than stated in the above prescriptions, not only a considerable quantity more crystallized oxalic acid is obtained, but it dries and gives off its water rapidly without acquiring any colour. When, therefore, oxalic acid has been prepared according to the above prescriptions, it is only necessary to boil the mother-ley with more nitric acid of sp. gr. 1.38 as long as nitrous acid is evolved, and to leave it then to crystallize, to obtain, on each repetition of this operation, beautiful



crystals of oxalic acid; even the last drop of mother-water solidifies to a crystalline mass. It is only necessary, in this mode of treatment, to observe, that there be always sufficient nitric acid in the boiling ley, which is easily recognized, either by the fluid remaining perfectly clear or faintly yellow, or from the evolution of the red vapours of nitrous acid; when too little nitric acid is in the mixture, it becomes of a dark yellow, then brown, and subsequently of a black colour. The crystals thus obtained, must, while moist, be dissolved in double their weight of boiling distilled water, with the addition of some nitric acid, filtered hot, and left at rest, when after a few hours the whole vessel will be filled with oxalic acid. The mother-ley, decanted from the crystals, is concentrated, and again placed aside. The crystals so obtained are brought on to a funnel, and when drained, washed with a few drops of cold distilled water and then dried at the ordinary temperature on blotting-paper; they are then only contaminated with a trace of nitric acid.

The author now made the following experiments, in which 1 part in weight of sugar was treated with 2, 4, 6, 8, 10, and 12 parts in weight of nitric acid of 1.38 spec. grav. boiled in flasks, each of the fluids evaporated to the same volume, and left over night at a temperature of 24° Fahr. In each of the experiments 3.042 grammes of dried sugar were employed; the cold masses had the following properties:—

*a.* 1 sugar with 2 nitric acid afforded a colourless thick syrup without any crystals; on being slightly warmed it became yellow, then brown, subsequently black.

*b.* 1 sugar with 4 acid: also a thick colourless syrup, but mixed with crystals of oxalic acid; on being warmed it likewise became yellow, brown and black.

*c.* 1 sugar and 6 acid: the entire mass appeared colourless and crystalline; on being stirred with a glass rod it formed a tenacious thick lump of crystals, which did not dry, and on warming, became yellow and then brown.

*d.* 1 sugar with 8 acid gave beautiful laminar crystals. Brought on to white paper they dried somewhat slowly and adhered together, which led to a suspicion of some foreign admixture. Dried in the air they afforded 1.872 gramme, or 62 per cent. These crystals effloresced at 212° Fahr. and assumed a yellowish colour; they then weighed 1.242 gr.

*e.* 1 sugar with 10 acid also afforded colourless crystals, without any mother-ley, which weighed 1.562 gramme, or 52.07 per cent.; effloresced quicker than the preceding, and then weighed 1.117 gramme.

*f.* 1 sugar with 12 acid gave 1.357 gramme very beautiful shining large laminar crystals, which dried rapidly on paper, and gave off their 2 atoms of water of crystallization within an hour, at 212°, retaining the perfect form of the crystal, only becoming white and dull; they weighed 0.959 gramme in this state.

The three last experiments were repeated with greater quantities of sugar.



29.69 grammes of dried sugar, in lumps, were treated with 237.5 grammes nitric acid, at  $37^{\circ}$ ; after a few minutes the fluid round the sugar acquired a pale reddish colour; heated to  $54^{\circ}$  the colour was faint yellow; at  $95^{\circ}$  the sugar became fluid and yellow, the supernatant nitric acid perfectly transparent; at  $113^{\circ}$  the whole liquid became yellow, and a slow evolution of nitrous acid fumes now commenced; at  $131^{\circ}$  the liquid was greenish yellow; at  $140^{\circ}$  olive green; at  $149^{\circ}$  scarcely transparent; at  $158^{\circ}$  perfectly opaque, and at this temperature the most violent action took place; at  $173^{\circ}$  the violence diminished; the liquid at the bottom of the vessel again became yellowish green, at  $176^{\circ}$  perfectly transparent and light coloured; at  $192^{\circ}$  the evolution of nitrous acid proceeded slowly in small bubbles. From  $158^{\circ}$  the temperature was raised to  $194^{\circ}$  by the heat set free in the process of decomposition. When heat was again applied the liquid boiled quickly, the greenish yellow colour passed into a dark yellow, at  $198^{\circ}$  to  $205^{\circ}$  into a golden yellow, and the thermometer then sank to  $185^{\circ}$ , when a weak action still continued for some time.

57 grammes of sugar were treated with 570 grammes nitric acid, and immediately heated; at first the layer next the sugar became coloured, then the entire mass yellow, subsequently dark green. During the most violent action the whole fluid became opaque, dark green, and the nitrous acid evolved in very dark streams. This violent action did not last long, and the fluid again became olive green, dark, and subsequently light yellow.

26.85 grammes sugar and 322.2 grammes nitric acid were left in quiet at a temperature of  $41^{\circ}$  Fahr., a slight action took place, but soon the liquid assumed a beautiful dark green transparent colour, and when heated a violent action immediately ensued. Notwithstanding the storminess of the action, there is no fear of an ebullition of the liquid, and the vessel may be filled  $\frac{4}{5}$ ths without the slightest danger.

It is evident from these experiments, that the best proportion for preparing oxalic acid is, for every 1 part of sugar dried at  $212^{\circ}$  Fahr. 8.25 nitric acid of 1.38 spec. grav. The digested mixture is evaporated to a sixth, and left to crystallize. The whole operation is finished in an hour or two. The produce obtained amounts to from 58 to 60 per cent. of the employed sugar of air-dried beautifully crystallized oxalic acid.

The great amount of nitric acid renders the preparation expensive, and it may be obtained by other more circuitous methods, and indeed chemically pure, from the oxalate of lead, as above described, but the acid should always then be sublimed. The subliming of oxalic acid requires attention, and can only be effected without loss in an oil or air-bath, and at an accurately fixed temperature; the acid to be sublimed must previously have been deprived of its 2 atoms of water of crystallization. The acid prepared from the lead salt, and containing potash, and also a not perfectly dried oxalic acid, begin to sublime at  $266^{\circ}$  and at  $302^{\circ}$ ; deposits itself in beautiful needles at  $314^{\circ}$ , carbonic oxide and carbonic acid being given off



as the products of decomposition. After termination of the sublimation, a residue containing potash remains behind. The acid, prepared from sugar and totally deprived of its water, begins to sublime at  $275^{\circ}$ , and can be heated without decomposition to  $325^{\circ}$ . At  $338^{\circ}$  the products of decomposition slowly escape; at  $431^{\circ}$  the 1 atom of water of crystallization still contained in the effloresced acid escapes all at once, and precipitates itself over the entire tube, upon which at  $440^{\circ}$  beautiful needles are again deposited, which melt and are decomposed at  $450^{\circ}$ .

Pure oxalic acid is not decomposed, as is generally supposed, by nitric acid; for when 0.4 gr. effloresced acid was boiled with 10.0 grs. nitric acid of spec. grav. 1.38, and evaporated, the acid crystallized free from colour, and sublimed unchanged without any loss.

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Oxalic acid frequently occurs contaminated with tartaric acid, and also with sulphate of potash. These impurities are easily detected. When a portion of the acid is digested in a test tube with concentrated sulphuric acid, it should remain colourless; if tartaric acid is present it becomes black. Barytes will indicate the presence of sulphate of potash by the formation of a white precipitate of sulphate of barytes, which is insoluble in excess of nitric acid, even when boiled with it.

#### *On the yellow Colour of the Barberry, and its Uses in the Arts.*

A paper on this subject, by Mr. Edward Solly, has appeared in the 'Journal of the Royal Asiatic Society, No. XIII.,' of which the following is an abstract. The principal use of the root of the common Barberry (*Berberis vulgaris*) is in dyeing or staining leather yellow. It is a drug which is beginning to be much sought after, and Mr. Solly was consequently led to inquire whether the substance could not be advantageously obtained from India. The colouring matter is found in the whole of the root, but in the stem it is only deposited round the pith and near the bark; the great bulk of the woody fibre contains no colour; the finest colour is found in the largest stems. The species of *Berberis* are distributed through every part of the globe, and are very abundant in the north of India. Mr. Solly made some experiments on a portion of root from India, and found it to contain about the same quantity of berberine, or colouring matter, as the root of the European species, which possessed an equally good, if not better tint than that obtained from Cologne and Hamburg. As the weight of the colouring matter bears but a small proportion to the ligneous fibre (in the root 17 per cent.), it would be advisable to have the wood extracted in India, and the extracts sent over. This could well be effected, the natives being well-skilled in preparing extracts, for they are in the habit of using a preparation of barberry medicinally.



## PATENTS.

*Patent granted to John Swindells, of Manchester, Lancashire, for Improvements in the Manufacture of Prussian Blue, Prussiate of Potash, and Prussiate of Soda.*

THE improvements consist in producing prussiate of soda and Prussian blue during the process of manufacturing carbonate of potash, carbonate of soda, and British alkali, commonly called soda-ash. The common method pursued in manufacturing these articles is by forming a mixture of the sulphate of potash or sulphate of soda, lime or carbonate of lime, and small coal, or any other carbonaceous matter, and subjecting them to heat in reverberatory furnaces, and thereby decomposing the sulphates, and producing carbonate of potash or soda, and likewise a quantity of sulphuret of potassium or sodium, according to the article operated upon. In the present process lime or carbonate of lime are dispensed with, and along with the various sulphates a quantity of ground coal of the best caking description used, and also a quantity of iron filings or boring, in manner following; namely, any quantity of the sulphate of potash or sulphate of soda is taken, and fused in a reverberatory furnace such as is commonly used in the manufacture of alkalies, and then by degrees a mixture of small caking coal and iron filings added in the proportion of one part of iron filings to eight of coal, until to the fused sulphates one-half their weight of coal has been added, or more if the sulphates require it, taking care to stir the materials well during the addition of the coal and iron filings, and also for ten or fifteen minutes after the whole of the coal is added, when the material will be ready to remove from the furnace and allowed to cool. The same results are produced by mixing, in the first instance, the coal and iron filings with the various sulphates, and then fusing them in the furnace in the usual way, or the iron filings may be omitted in the process, but the addition is preferred. The materials, after cooling, are dissolved in water, and when the solution has subsided, evaporated until it has obtained a specific gravity of 1.320 at a boiling heat, then transferred into coolers, when the prussiate of potash or prussiate of soda crystallizes in the course of four or five days. The solution now will consist of carbonate of potash or soda and sulphuret of potassium or sodium, which sulphuret may be removed by the usual methods employed for that purpose. The crystals of prussiate of potash or prussiate of soda will require to be redissolved and recrystallized, when they will be ready for use or sale, or they may be manufactured into Prussian blue in the usual way.—Sealed April 16, 1839.

*Patent granted to Anthony Theophilus Merry, of Birmingham, for improved Processes for obtaining Zinc and Lead from their respective Ores, and for the Calcination of other Metallic Bodies.*

The improved process or processes consist in the application of the heat arising from the carbonizing or converting of pit coal into coke, to certain furnaces and subliming vessels, suitably constructed for calcining, roasting and smelting the ores of zinc and lead.



The mode of calcining, &c. the ores of zinc is as follows :—When operating upon sulphuret of zinc, the impure ore is reduced to a coarse powder and carefully washed ; it is then calcined in a reverberatory furnace for 24 hours, the heat being slowly applied during the first six hours, and after that increased to a strong red heat, which is continued for the remaining 18 hours, the ore being carefully stirred every half-hour. At the expiration of the 24 hours the sulphuret of zinc will have become decomposed, by which decomposition an impure oxide of zinc is obtained.

When operating upon the carbonate of zinc, it is washed and powdered the same as the sulphuret, and exposed in a reverberatory furnace to a strong red heat for 5 or 6 hours, being stirred occasionally with an iron rake, by which means the carbonate of zinc is decomposed, and an impure oxide of zinc is obtained.

The apparatus employed to convert the impure oxide of zinc into a metallic state consists of a coke-oven, the back of which is connected by a flue with a subliming furnace, containing 24 subliming pots, and this furnace communicates by another flue with a reverberatory furnace at the back of it, from which a third flue leads to a large chimney. The bottoms of the subliming pots are inserted into condensing pipes, the lower ends of which dip into vessels of water, provided to receive in drops the condensed vapours of the zinc.—Sealed Sept. 22, 1841.

*Patent granted to Goldsworthy Gurney, Esq., of Bude, Cornwall, for certain Improvements in the Production and Diffusion of Light.*

*Claim first.*—The mode of treating coal gas in its passage from the gas main to the burner or burners.

The object of this part of the invention is to improve the illuminating power, and, at the same time, to reduce the heat of the gas when burning. The materials employed for this purpose are muriate of zinc, sub-acetate of lead, chloride of baryta, and sulphate of manganese, which are employed in the following proportions, viz. 5 parts muriate of zinc, 2 parts sub-acetate of lead, 2 parts chloride of baryta, and 4 parts sulphate of manganese. The mixture thus formed is used, either dry or slightly moistened, in a similar vessel to those employed in purifying gas by the dry lime process, and the vessel is applied to the gas supply pipe ; so that the gas in passing from the main pipe may pass amongst, and be acted on, by the mixture before it reaches the burner or burners.

*Claim second.*—The mode of applying intermediate reflectors, of the length of the flame, and also combined therewith, and placed on a ground glass shade, or a refracting zone, or both together.

This part of the invention consists in the use of a reflector with two surfaces, placed about the centre of the flame, so as to diffuse a portion of the light upwards, and a portion of it downwards ; and according as it is placed higher or lower with respect to the length of the flame, so will the larger or smaller portion of light be diffused upwards or downwards. Upon this reflector, and surrounding the



upper part of the flame, is placed a ground glass shade or refractor, and inside this shade a refracting zone is placed, which consists of a cylinder of glass, cut on the outside into prismatic projecting rings, at such angles as to direct the light in the desired directions. The refracting zone may either be used separately, or combined with the ground glass refractor.

*Claim third.*—The mode of lighting apartments or rooms by means of burners, composed of concentric rings of tubes, combined with suitable glass chimneys.

*Claim fourth.*—The mode of applying conical glass chimneys to gas burners.

The burner is composed of a number of concentric rings or tubes, perforated in their upper surfaces, and connected with each other by the tubes that supply them with gas. The lower part of the flame is surrounded by a conical glass chimney, the upper opening of which is larger than the outer ring of the burner, and there is an open space around the flame, between the lower end of the upper chimney (which is an inverted cone) and the upper end of the lower chimney.—Sealed Sept. 25, 1841.

*Patent granted to Richard Laming, of Gower Street, Bedford Square, Surgeon, for Improvements in the Production of Carbonate of Ammonia.*

In the improved process, instead of distilling an ammoniacal carbonate direct from any substance or mixture capable of supplying it, as usual, the salt is obtained, either in a solid state, or dissolved more or less in water, by mixing together its separate acid and alkaline constituents.

One of the modes of operating according to these improvements, is to cause ammonia gas and carbonic acid gas to traverse a succession of leaden chambers, maintained at as cool a temperature as may be conveniently practicable, and so contrived as to favour the admixture of the dissimilar gases. Sometimes in one or more of the chambers a stratum of water, or of water impregnated with ammonia, is placed, and carbonic acid and ammonia gases, or carbonic acid gas, are introduced into it, in which cases, in the resulting salt or saline solution, a larger proportion of carbonic acid gas is obtained than when only the hygrometric moisture of the aëriform fluids is present.—Sealed Sept. 15, 1841.

*Patent granted to Julius Seybel, of Golden-square, Middlesex, for Improvements in the Manufacture of Sulphate of Soda and Chlorine.*

These improvements consist in the manufacture of sulphate of soda by decomposing common salt by sulphuric acid, in closed vessels of lead or lined with lead, having heat applied externally; and in a mode of manufacturing chlorine, by employing the vapours of muriatic acid, to act on manganese immersed in water, such vapours being conducted below and permitted to escape upwards through the water and manganese.—Sealed March 31, 1842.



# THE CHEMICAL GAZETTE.

No. VI.—Jan. 14, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Critical Sediments in the Urine consisting of Uric Acid.*  
By Dr. SCHEERER.

THE earlier opinions respecting the origin of the sediments which consist of uric acid are well known. Duvernay supposes the colouring substance of the urine to be the cause of the uric acid being so difficult to separate by acids from the urine; according to him it protects the uric acid and its salts, but as it is quickly decomposed it soon loses this power, and the acid urine now becomes turbid from the separation of uric acid. Dr. Scheerer does not deny that this colouring substance may have some influence on the solubility of the uric acid, but he does not admit that it protects it from the action of the free lactic acid, but believes, on the contrary, that the separation of the uric acid is chiefly due to the decomposition of this extractive substance. When the lactic acid begins to decompose the urate of soda, the first quantities of uric acid are probably soluble through the intermediation of the extractive matter; this latter is then itself decomposed, and the uric acid is precipitated, not from having lost all protection, but from the extractive matter furnishing lactic acid by its decomposition, and increasing the amount of free acid. This is evident from the quantity of free acid in the urine more frequently increasing after the separation of the uric acid, than decreasing; and moreover, on the addition of alcohol, filtration and boiling of the urine, the separation of the uric acid may be stopped or entirely prevented, and less lactic acid and lactates are then found in the liquid than after the entire separation of the uric acid. The effects of the above operations are the destruction or removal of the ferment, and consequent prevention of decomposition.

As soon as the conversion of the extractive matter into lactic acid (milk-fermentation), and the separation of the lactic acid has terminated, a new change commences in the urine. When it is left for 4 or 5 days over the sediments, these are again dissolved, the amount of free acid decreases, and frequently the urine even becomes alkaline; a white film then forms on the surface, which, observed under the microscope, consists entirely of globules of ferment. The urine now becomes turbid from the separation of phosphate of



lime, which is moreover increased by the ammonia which is formed combining with the uric acid, and being then deposited in the state of a yellow sediment. If muriatic acid is added to the urine immediately after the re-resolution of the sediment, it is again instantly precipitated. This re-resolution seems therefore to be owing to the soda which has been set free, probably from a partial decomposition of the lactate of soda by the ammonia. After complete removal of the urate of ammonia, the alkaline urine no longer affords a precipitate on being treated with acids, and numerous infusoria now make their appearance in it.

In the formation of calculi which consist of urate of ammonia, a similar process has probably taken place in the bladder. The mucus of the bladder, which is secreted by the mucous membrane in a diseased state, acts far more powerfully as a ferment than the healthy mucus; it effects therefore the decomposition of the extractive substance (which gives rise to the formation of lactic acid) and of the urea (which affords the ammonia) much quicker, which is of importance in the formation of uric acid calculi. Modifications of the above conditions at various periods of the disease, likewise explain the formation of those calculi which consist of layers of different composition. The greatest quantity of free lactic acid is met with in the bright red urine, which most abounds in extractive matter.—*Ann. der Chem. und Pharm.*, xlii. p. 171.

*On the Origin and Composition of the Sesquicarbonate of Soda.*  
By M. HERMANN.

It was formerly supposed that the sesquicarbonate of soda was formed on heating solutions of the bicarbonate to boiling, during which operation half an equivalent of carbonic acid was believed to escape. This has been refuted by Rose, who found that solutions of the bicarbonate of soda gave off entirely 1 atom of carbonic acid, either by long-continued boiling or by exposure in a vacuum. Rose did not succeed in obtaining crystals of the sesquicarbonate from solutions of equal atoms of the carbonate and bicarbonate of soda. The conditions under which the Trona salt is produced were hitherto perfectly unknown; according to M. Hermann, it does not originate, as is generally supposed, by crystallization from aqueous solutions, for it is decomposed into the bicarbonate and the neutral carbonate, which crystallize separately from the solution; but it is very easily produced by efflorescence. When therefore concentrated solutions of the bicarbonate of soda are evaporated quickly, and the second atom of carbonic acid is prevented in this manner from escaping entirely; or when equal atoms of the bicarbonate and of the crystallized carbonate are melted together in the water of crystallization of the former, and the mass dried; or lastly, when the bicarbonate of soda is exposed to heat, not allowing the temperature to exceed 482° Fahr., masses are obtained which consist for the greater part of the sesquicarbonate. To convert these masses into crystallized Trona salt, it is only requisite to expose them for a time to the



influence of a moist atmosphere, best in cellars. If the substances are examined after a few weeks, they will be found to have assumed a perfectly crystalline structure, and their cavities and fissures especially are clothed with innumerable shining groups of crystals, which consist entirely of perfectly pure crystallized sesquicarbonate of soda.

In a quantitative examination of this salt, it was found that the formula hitherto employed to represent the Trona salt ( $\text{Na O}^2 \text{C O}^3 + 4 \text{H O}$ ) was not quite exact, but that it corresponds to the formula  $\text{N O}^2 \text{C O}^3 + 3 \text{H O}$ . 100 parts gave—

	Found.	Atoms.		Calculated.
Soda.....	40.00	= 2 =	781.8	40.12
Carbonic acid ....	43.06	= 3 =	829.2	42.56
Water .....	16.94	= 3 =	337.4	17.32

On exposing the sesquicarbonate of soda to the heat of an Argand lamp, it leaves a  $\frac{2}{3}$ -carbonate behind, just in the same way as the bicarbonate of potash and soda. The Trona salt has therefore, in common with those two bicarbonates, the peculiarity, that on boiling its solutions it gives off more completely the excess of carbonic acid than by heating the dried salt.—*Journ. für Prakt. Chem.*, xxvi. p. 312.

*On the Combination of Urea with the Hydracids. By M. ERDMANN.*

Regnault first observed that the combinations of urea with the oxy-acids, for instance the nitrate and oxalate of urea, which were previously supposed to be free from water, always contained 1 atom of water, and resembled in this respect the corresponding salts of the organic bases. This behaviour would greatly support the view of ammonia being the base of urea, if at the same time it could be shown that the hydracids combine with urea without any water. In order to form combinations of urea with hydracids, the simplest method appears to be to decompose the oxalates of urea by means of chloride of calcium or cyanide of calcium, which should afford oxalate of lime, and the combination of urea with the hydrochloric acid or hydrocyanic acid. However, the preparation of the hydrochlorate and hydrocyanate of urea does not succeed in this manner. The result obtained is a solution of chloride of calcium in the oxalate of urea, or *vice versâ*—a very acid liquid in which urea and hydrochloric acid exist in an uncombined state; on evaporation the hydrochloric acid is evolved, and when the fluid is reduced to a very small volume, free urea and chloride of ammonium crystallize from it. The result is similar with hydrocyanic acid; the liquid disengages prussic acid, and is entirely decomposed.

According to an observation of Liebig in the 'Handwörterbuch der Chemie\*', Hagen has found that dry urea combines directly with hydrochloric acid gas†. Erdmann caused M. Krutzsch to

\* Art. 'Organische Basen.'

† This has also been proved by M. Pelouze. See p. 58 of this Journal.—Ed.



repeat Hagen's experiment, in order to ascertain the quantitative proportion in which the urea combined with the dry hydrochloric acid gas, and the following results were obtained:—

The urea begins to melt from the influence of the hydrochloric acid gas, which had been previously dried by means of sulphuric acid and chloride of calcium, and the gas is quickly absorbed. If the action is assisted by immersing the apparatus into a water-bath (Liebig's cylindrical drying apparatus serves this purpose very well, and should be placed rather sloping), perfect saturation takes place pretty easily. As long as the combination is warm it forms a pale yellow oily fluid, out of which, after the absorption has ceased, the excess of hydrochloric acid may be driven by a stream of dry atmospheric air. On cooling, the hydrochlorate of urea solidifies with a considerable development of heat to a laminated and radiant crystalline hard white mass. The urea had taken up 37·2 to 37·5 per cent. of hydrochloric acid.

The combination is therefore composed according to the formula  $\text{C}^2\text{H}^4\text{N}^2\text{O}^2 + \text{HCl}$ , which requires 37·61 per cent. of hydrochloric acid.

The affinity of urea to hydrochloric acid is therefore but very weak. As soon as hydrochlorate of urea is exposed to the air, it becomes moist and dissolves into a very acid liquid, from which the hydrochloric acid is disengaged. It is directly decomposed by water into free hydrochloric acid and urea. In boiling pure alcohol it dissolves, apparently unchanged; the fluid offered no smell of æther. On cooling, some crystals appeared in the fluid, which however were not the hydrochlorate of urea, but chloride of ammonium. Nitric acid, conveyed into the alcoholic solution, directly afforded a most abundant precipitate of nitrate of urea.—*Journ. für Prakt. Chem.*, xxv. p. 506–508.

*On Elaterine.* By M. ZWENGER.

When *Elaterium album* is digested with alcohol until this remains colourless, and the filtered solution evaporated to the half of its volume, a white somewhat greenish-coloured powder is obtained on the addition of water, which Morries, who first prepared it, called elaterine. The colouring substance can be removed by washing with æther, in which elaterine is nearly insoluble. After several crystallizations from absolute alcohol, it is obtained in colourless six-sided prisms of strong lustre.

On analysis it was found to be composed of—

	Found.	Atoms.		Calculated.
Carbon . . . . .	69·29	= 20 =	1517·08	69·17
Hydrogen . . . . .	8·20	= 28 =	174·72	7·97
Oxygen . . . . .	22·50	= 5 =	500·00	22·86
			<hr/> 2191·8	<hr/> 100·00

Elaterine contains no nitrogen, which was ascertained by an analysis according to the method of Will and Varrentrapp; 0·372 gr. substance gave 0·012 ammonio-chloride of platinum(?), which



answers to 0.204 nitrogen in 100, supposing the residue to consist of the pure ammonio-chloride, and which can only be ascribed to an accidental impurity\*.

Elaterine melts at 392° Fahr.; previous to melting it becomes yellow, and forms afterwards a transparent yellowish amorphous mass, which on cooling cracks into fissures. Elaterine does not lose in weight by melting. At a higher temperature it is decomposed, and gives off white styptic-smelling vapours, which on being ignited burn with a sooty flame.

It is insoluble in water, scarcely soluble in æther, but very easily in alcohol; the solutions have no action on litmus paper; it is not dissolved by dilute acids or alkalies. Concentrated sulphuric acid dissolves it with a dark red colour, from which water precipitates a dark brown mass. Fuming nitric acid easily dissolves it; on adding water it is again separated wholly unchanged. It is not at all dissolved by muriatic acid. Combinations of elaterine with bases could not be obtained.—*Ann. der Chem. und Pharm.*, Sept. 1842, p. 359.

#### *On Sanguinarine. By M. SCHIEL.*

According to M. Dana, sanguinarine is extracted from the root of the *Sanguinaria Canadensis* by treating it with anhydrous alcohol, adding water and ammonia to the solution, then washing the red precipitate formed with acid, and boiling it in water and animal charcoal. After pouring off the water, the mixture of the base and charcoal is to be treated with alcohol, and the solution being evaporated, the base remains in the state of a mass of a pearl-gray colour. M. Schiel prefers in preparing this substance the process adopted by Probst for that of chelerythrine, procured from the *Chelidonium majus*, the appearance of which resembles that of the sanguinarine.

The dried and powdered root is to be treated with æther; the solution is to be filtered, and a current of hydrochloric acid gas is to be passed into it. This acid occasions the precipitation of impure hydrochlorate of sanguinarine, which is separated by filtration; this being dried by a gentle heat is to be dissolved in hot water, and excess of ammonia added to the solution. The precipitate, which is then formed, is washed upon the filter and then dissolved in æther. The solution is to be shaken with blood-charcoal recently calcined, until, on depositing the charcoal, it appears quite colourless; on passing hydrochloric acid gas into the solution, a precipitate of pure hydrochlorate of sanguinarine of a magnificent scarlet colour is obtained. This salt, when dissolved in water, yields, on the addition of ammonia, pure sanguinarine in white or slightly coloured flocks, which become a yellow powder by washing and drying.

\* This is another proof of the incorrectness of the assertion of M. Reiset respecting the formation of ammonia when organic substances are burnt with caustic soda and lime. At one of the last meetings of the Chemical Society I called attention to this residue, which under the microscope does not exhibit the least trace of the yellow salt of the ammonio-chloride of platinum, but has a dull brownish-black amorphous appearance.—W. F.



Sanguinarine is insipid, occasions violent sneezing, and soon becomes red in an atmosphere which contains even a small quantity of acid vapours. It is insoluble in water, very soluble in alcohol and æther; the alcoholic solution has a very bitter taste, and a manifestly alkaline reaction. When heated it fuses, and has the appearance of an oil, and when burnt it leaves no residue. It neutralizes acids perfectly and forms red salts with them, which are very soluble in water, and possess very decided bitterness. Chloride of platina precipitates them of an orange-red, and infusion of galls of a yellowish-red colour. Concentrated nitric acid decomposes sanguinarine, and when dried at  $212^{\circ}$  it consists of

Carbon .....	70.03
Hydrogen .....	5.27
Azote .....	5.23
Oxygen .....	19.47
	<hr/>
	100.

The following formula is that which best agrees with the results of analysis :—

37 atoms of carbon .....	2806.45	or	70.62
32 ... hydrogen ....	190.00	...	4.78
2 ... azote .....	177.03	...	4.45
8 ... oxygen .....	800.00	...	20.15
	<hr/>		<hr/>
	3973.48		100.

*Hydrochlorate of Sanguinarine.*—This salt, obtained by the process already indicated, is a red, agglutinated, friable mass; the powder, when examined by a microscope, appears to be an agglomeration of well-defined small crystals. This salt is very soluble in water and in alcohol, especially when heated; but it is insoluble in æther.—*Journal de Pharm. et de Chimie*, Novembre 1842, and *Philosophical Magazine*, Jan. 1843.

### *Iodine in Plants.*

Dr. Dickie brought before the Edinburgh Botanical Society a notice of the presence of iodine in some plants growing near the sea. He found, by chemical examination of specimens of *Statice Armeria* from the sea-shore, and of others from the inland and higher districts of Aberdeenshire, that the former contained iodine, and that soda was more abundant in them, while potass prevailed in the latter. Iodine was also found in *Grimmia maritima*; and Mr. P. Grant of Aberdeen has found it in *Pyrethrum maritimum*. An analysis was made of examples of *Statice Armeria*, *Grimmia maritima*, *Lichina confinis*, and *Ramalina scopulorum*, all growing near the same spot, and occasionally during storms exposed to the sea-spray; and all these plants, with the exception of the lichen, contained iodine. The specimens having been washed previous to analysis, the iodine could not have been derived from saline incrustation. All these vegetables were healthy, and the author of the



paper has been led to conclude that marine algæ are not the only plants which possess the power of separating from sea-water the compounds of iodine and of condensing them in their tissues, and this without any detriment to their healthy functions.

*Quinine in the Urine, in the Excrements, and in the Blood.*

M. Landerer has shown, on a former occasion, that after the administration of quinine it is found in the blood and in the excrements. In a recent examination of the urine he again found it both in the liquid urine, and also in the yellowish-red sediments, which consisted of phosphate and urate of lime and carbonate of ammonia. He also examined the blood of two patients suffering from intermittent fever, and who had been bled on account of inflammatory complications. The serous fluid of the blood had a decided bitter taste, and when evaporated, and the residue digested with acidulated water, the extract afforded quinine on being precipitated with ammonia.—*Buch. Rept.*, xxv. p. 243.

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## ANALYTICAL CHEMISTRY.

*On a New Method for distinguishing between Antimony and Arsenic, and for their absolute Separation.*

WE have had frequent occasion, since the commencement of our work, to notice this important subject, and we now again call the attention of our readers to a decidedly improved method recently proposed by Dr. Fresenius in the September Number of the ‘*Annalen der Chemie und Pharmacie*,’ by which even a quantitative separation of arsenic from antimony may be effected. It might be objected to Pettenkofer’s test (see pp. 6 and 60), that the difference between the colours of the two sulphurets is not sufficiently great; yellow and orange are not like black and white, and between more or less volatile there is also no precise limit. The method which will now be described is based on an absolute separation of the antimony from the arsenic, and is therefore not open to those objections. It is founded on Pettenkofer’s method, which is described at p. 6 of this Journal. It will however be best to commence with the beginning.

A thick metallic ring is obtained in the usual way by heating the glass tube through which the hydrogen gas, containing arsenic or antimony, is passed; the first tube changed for a second, third, and so on, as long as distinct films are formed. A very slow current of sulphuretted hydrogen is now passed through these tubes, so that the gas, when ignited at the open end, just continues to burn; the metallic film is heated gently with a small spirit-lamp, commencing at that part situated furthest from the apparatus in which the gas is generated, and proceeding towards it,—in an opposite direction therefore to the current. With tubes of a moderate length



and a little practice, the conversion of the metals into their sulphurets is effected without the slightest loss.

A strong current of muriatic acid gas, which is obtained by adding a small quantity of common salt to sulphuric acid, and gently warming, is now passed through these same glass tubes. Between the vessel in which the gas is generated and the glass tube containing the metallic sulphurets, a short and broad tube, filled with loose cotton, should be placed. When the metallic film consists solely of antimony, the sulphuret disappears instantaneously if it be but a slight film, and in a few seconds if a thick ring. The sulphuret of antimony is decomposed by the hydrochloric acid, and the chloride of antimony which is formed is extremely volatile in the current of muriatic gas. If this be conveyed into water, the presence of the antimony may easily be detected by sulphuretted hydrogen and other tests. If the metallic film consist only of arsenic, and of course only the yellow sulphuret of arsenic be contained in the tube, the whole remains unaltered; the muriatic gas, even when passed for a considerable length of time over the sulphuret of arsenic, has no influence on it. If both antimony and arsenic be present, the sulphuret of antimony soon disappears, and the sulphuret of arsenic is left alone behind. The tube is now taken away, and the one end sealed, and some solution of ammonia poured into it, which immediately dissolves the yellow film, thus affording at once certainty of its being sulphuret of arsenic. The ammoniacal liquor may now be evaporated on a watch-glass, and in this manner the entire quantity of the arsenic which was in the film may be again obtained in the state of sulphuret, and submitted to any further examination.

This method is preferable to all that have yet been proposed, as the arsenic can be completely isolated, and moreover recognized, without any of it being lost.

*On the Reduction of the Salts of the Peroxide of Iron by Means of Organic Acids.* By M. WACKENRODER.

It is well known that the *volatile* monobasic organic acids which contain no nitrogen do not reduce either the acetate of the peroxide of iron to the state of protoxide, or the perchloride to that of the protochloride. Oxalic acid however forms an exception; the reduction results not only through the agency of sun-light, but also on being submitted even to a moderate heat. Formic acid also produces, on being boiled with perchloride of iron, a small quantity of the protochloride.

The *non-volatile* polybasic organic acids, likewise free from nitrogen, have all, on the contrary, a reducing action on the peroxide and perchloride of iron, some only with the assistance of heat, some instantaneously in the cold.

1. Malic acid, kinic acid, citric acid, racemic acid, tartaric and mucic acid, deoxidize the peroxide alone, but more so when in combination with alkalies, when boiled with it or its salts. But the



whole of the oxide is not entirely destroyed; the peroxide of the protoxide of iron (the magnetic oxide) is formed, which might lead to the belief that constant double salts of the peroxide and protoxide originate.

What change takes place in the constitution of the organic acids, especially of tartaric acid, in consequence of the reception of the oxygen from the peroxide of iron, is still a question to be answered. M. Wackenroder could never detect any evolution of gas during the reduction.

2. Those acids which change so easily their constitution, and which very closely resemble one another, for instance gallic acid, tannic acid, catechuic acid and humic acid, act with greater energy on the peroxide and perchloride of iron. They do not require the assistance of heat, but are able, at least the gallic acid, to reduce the perchloride entirely into the protochloride. The coloured compounds which are precipitated by these acids from salts of the peroxide of iron, always contain the magnetic oxide. The rapidity with which the reduction ensues is evident, for when a very small quantity of one of the above acids is added to a solution of the perchloride of iron containing ferro-sesquicyanide of potassium, the liquid immediately assumes a bluish green colour, and sometimes even a dark blue precipitate is formed.

The intensive red colouring produced in solutions of salts of the peroxide of iron by meconic acid, is likewise probably owing to some change in the peroxide. However, when ferro-sesquicyanide of potassium is added to the reddened solution of the perchloride, it is a long time before a blue precipitate is formed.—*Archiv der Pharm.*, xxviii. p. 194.

## PHARMACOLOGY.

*On Phormium tenax as a Substitute for Sarsaparilla.* By Dr. DIEFFENBACH, Naturalist to the New Zealand Company.

To W. FRANCIS, Esq.

DEAR SIR,

YOU are aware of the existence of a plant in New Zealand which yields a strong and beautiful flax, serves the natives for the manufacturing of their articles of dress, fishing nets, and so on, and which is most invaluable to them. You know, of course, that I mean the *Phormium tenax*. But I do not believe it is known that the root of this very same plant is also used by the natives, and by the old European settlers, as a powerful medicine, and that it will very likely prove an excellent addition to our Materia Medica, or a substitute for more expensive medicines, as it can be obtained in any quantity, and might prove an additional resource to that British possession. *Phormium tenax* belongs to a family of plants most of which possess some powerful principles, viz. the *Liliaceæ* of Lindley, and amongst them the latter author has placed it under the *Asparagineæ*, and Robert Brown, with Sir William Hooker, under the



*Asphodeleæ*. Wherever its true botanical place may be, its relations are sufficiently evident, as well as to the *Smilacææ*, which gives us the invaluable *Sarsaparilla*. Its root is indeed used for all the purposes for which we give the latter. It is a thick, fleshy, tuberous root, of a yellowish appearance if cut when fresh, and of a rather nauseous and somewhat acrid taste. If made into a decoction, it increases all the secretions of the mucous membranes and the external skin; it is purgative, expectorant, strongly diuretic, and after its use the skin is covered with perspiration. There are however no violent symptoms connected with its use, as with other acrids; no pain in the stomach or affections of the nervous system; on the contrary, although far more powerful than *Sarsaparilla* (which however may arise from the large quantity used for a decoction), it seems to resemble the latter most in its effects in producing a general change of the metamorphosis. I have been assured that most inveterate cases of syphilis, chronic exanthematic diseases, and scrophulosis, have yielded to it; and from this testimony of natives and older settlers, I have indeed in many cases been induced to recommend it, but was unable to watch its effects. As its taste is rather nauseous, some of the Europeans mix it with the leaves of the Kawa (*Piper excelsum*), which are aromatic and spicy; or with those of the Manuka (*Leptospermum scoparium*), which contain a more fixed balsamic principle, and which themselves are in very common use as well-flavoured and highly diuretic substitutes for tea. During my travels in New Zealand I often used both; and at some parts of the coast, where whaling gangs are established, the whalers have often no other beverage for a long time.

Would it not be interesting, Mr. Editor, to subject all these plants to an accurate analysis? Not merely because it is never advisable, as an old medical instructor of mine used to say, to despise the nostrums of old women, and I may add, of so called savage nations, but because you might see whether the two latter plants contained the same principle as the Chinese tea. If you would do so, and also analyse the root of the *Phormium*, I have no doubt that excellent botanist Sir William Hooker, at Kew Gardens, will provide you with specimens, as *Phormium* and *Leptospermum* are found at all events in that beautiful collection. I have no doubt the New Zealand Company will send for a quantity of these vegetables for making a trial\*.

I am, yours truly,

E. DIEFFENBACH.

Jan. 5, 1843.

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#### On *Ruta graveolens*.

From some experiments of M. Kuemmel, it appears that the official *Ruta* contains a peculiar non-volatile acid, which exists in the plant in combination with lime. He gives the following method for obtaining the acid:—The fresh herb is pounded several times with

\* We should have much pleasure in subjecting any of these vegetable productions to analysis.—W. F.



water at about 122° Fahr.; the expressed liquor separated by boiling from the sediments, then decolorized and precipitated with a solution of sugar of lead. The precipitate,edulcorated and dried, is now reduced to a fine powder and suspended in water, the lead thrown down either by sulphuretted hydrogen or sulphuric acid, and the filtered solution evaporated to crystallization. Its solution has an acid reaction and taste, and affords with neutral and with the basic acetate of lead a yellowish white precipitate; with perchloride of iron a dark green colouring without any turbidness, which is very characteristic. It burns, giving off a smell of *Ruta*, to a loose coal, which is not easily wholly consumed.—*Archiv der Pharm.*, xxxi. p. 166.

*Aceyta ameria.*

In the list of prices of druggists a gum-resin from North America occurs at present under this name, which, according to Wittstein, is probably obtained by incisions in the stems of some tree. It forms amorphous dark green masses of a slight terebinthinaceous smell and of bitter taste. It is brittle in the cold, but the warmth of the hand renders it soft and tenacious; it melts easily, and burns with a bright sooty flame, giving off a disagreeable smell. It is insoluble in water, but soluble in alcohol, æther and oil of turpentine, with a green colour. The alcoholic solution has a slightly acid action, a bitter astringent taste, and colours solution of perchloride of iron dark blue. Caustic potash colours the resin yellow, and dissolves it on the addition of water. It is dissolved with difficulty by concentrated sulphuric acid, and forms a yellow solution, from which water precipitates it in dirty white flakes. Caustic ammonia affords a turbid solution, from which muriatic acid throws it down in grayish white flakes, which on being melted afford the original green resin.—*Buch. Rept.*, xxiv. p. 249.

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## CHEMICAL PREPARATIONS.

### *Preparation of the Oxide of Platinum.* By M. WITTSTEIN.

THE sulphate of platina for this purpose was prepared by dissolving the platinum in *aqua regia*, and then adding to it sulphuric acid, for 24 parts platinum 23 parts sulphuric acid, and heating this mixture on the sand-bath in a porcelain basin, constantly stirring until the mass had become converted into a dry black powder. If a small quantity of chloride of platinum should remain undecomposed, it does not affect the purity of the oxide. The dried mass attracted much moisture from the atmosphere, and dissolved entirely in water. The solution was precipitated with nitrate of barytes, and the sulphate of barytes removed by filtration. The liquid was divided into two equal portions, and caustic soda added to the one half as long as any precipitate was produced; the other half then mixed with it, and the brown sediment collected on a filter. The liquid which has passed through is of almost as dark a colour as previous to the ad-



dition of the soda; the precipitate, when perfectlyedulcorated and dried, forms dark brown shining pieces, which afford on pulverization an umber brown powder, which was found only to amount to a seventh of the weight of the platinum dissolved, and moreover was not perfectly free from alkali.

Experiments were now made with the carbonate of lime, which has the property of precipitating all those oxides which contain more than 1 atom of oxygen. The liquid which had been separated from the precipitate formed by the soda, was again made acid with nitric acid, and then shaken with a portion of carbonate of lime. No action appeared to take place in the cold, for the carbonate of lime remained white and the liquid dark brown; but on boiling, a brown precipitate soon separated, and the supernatant liquor became of a much lighter colour, but still pale yellow; and nitrate of silver produced a considerable precipitate of the chloride of silver, which showed that a portion of the chloride of platinum had not been decomposed by treatment with sulphuric acid.

The brown precipitate was carefully washed, and then digested with acetic acid, to remove the excess of carbonate of lime, and the residue againedulcorated. Thisedulcoration is however a very tedious operation, and when pure water was employed, seemed never to finish; for after it had been continued for 5 months, traces of lime could be detected in the liquid which passed through. The precipitate was therefore treated with acetic acid, which after filtration afforded a strong turbidness when tested with oxalate of ammonia; the washing then continued with water containing a third of acetic acid, and in this manner the precipitate was obtained perfectly free from lime at the end of three weeks.

The oxide of platinum, purified in this manner, formed when dry an umber brown powder, without any reddish tint. Exposed for a long time to the heat of boiling water, it does not change in external appearance. On being exposed to heat in a platinum crucible, it decomposes with explosion, giving off a blackish smoke, and a part of the preparation is thrown out, while the inside of the crucible becomes coated with spongy platinum. To find out its composition 9.3 grammes were placed in a glass tube 5 inches long and sealed at one extremity, and gradually heated over an Argand lamp. After decomposition the contents of the tube were washed out, collected on a filter and ignited; 6.88 grs. metallic platinum were obtained, which correspond to  $9.25 \text{ Pt O}_2 + 2 \text{ aq.}$  The brown oxide, according to this, is a bihydrate, in which the oxygen of the water is equal to the amount of oxygen in the oxide.—*Buch. Rept.*, xxiv. p. 45.

*Preparation of the Iodide of Gold.* By M. ALPHONSE MEILLET.

An exceedingly beautiful iodide of gold may be obtained by the following process:—Take some hydriodate of ammonia, which is quite neutral, and prepare a solution of gold, likewise as neutral as possible; then pour by degrees the hydriodate of ammonia into the



solution of gold, until no further precipitate is formed. The liquors must be but moderately diluted. A small quantity of alcohol is then added, about a third of the total volume of the liquid. After it has stood some hours, it is decanted gently, and a blackish precipitate, composed of iodine and of iodide of gold, is obtained. It is washed with a little alcohol, and the iodide of gold, almost white and semi-crystalline, is left behind. It is dried by exposure to the air on a plate, and must be preserved from the light.

The above process has the advantage that the gold is entirely precipitated, which never happens when iodide of potassium is employed; and, moreover, the iodide thus obtained is not variable in its composition.—*Journ. der Pharm.*, Nov. 1841.

### *Syrupus Althææ.*

Frequently the syrup of white sugar is sold for *Syr. Alth.* This is easily detected, as the latter is coloured yellow by alkalies, the sugar syrup not.—*Jahrb. für Prakt. Pharm.*, 1841, p. 349.

### *Preparation of Chloride of Lead.*

M. Anthon recommends the following process:—4 to 5 parts of freshly pulverized litharge are mixed with 1 part salt and some water till the whole appears white and does not thicken any more; it is then left to stand for a couple of days, and extracted with water. The basic chloride of lead is mixed with a sufficient quantity of muriatic acid, heated and edulcorated.—*Buch. Rept.*, xxvi. p. 123.

### *Preparation of Succinic Acid from Japanese Wax.*

M. Sthamer has found this acid to be produced in large quantity and of great purity on submitting Japanese wax (*Cera Japonica*) to the oxidizing action of nitric acid. From the cheapness of the material it might be advantageous to prepare succinic acid according to this method on a large scale. The wax is digested in a retort with strong nitric acid for some weeks on a sand-bath, and the nitric acid which distils over returned. On cooling, the succinic acid then separates in crusts of white crystals.

Succinic acid is also afforded by many other fatty bodies when acted on by nitric acid, for instance spermaceti and common wax.—*Ann. der Chem. und Pharm.*, Sept. 1842.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *Theory of the Manufacture of Vinegar.*

VINEGAR is essentially a mixture of a peculiar organic acid, acetic acid, and of water, but it always contains a small quantity of acetic



æther, and various foreign ingredients, according to the substances from which it has been prepared. The most concentrated acetic acid, which is also termed glacial acetic acid, is a colourless liquid of a penetrating acid smell, and of a sharp acid somewhat biting taste. At a moderate cold it becomes solid (freezes); it boils at a somewhat higher temperature than water. It may be mixed in all proportions with water. Its specific weight is 1.063. The strongest kinds of vinegar that occur in commerce contain from 5 to 6 per cent., the weaker 3 to 5 per cent.

In the manufacture of vinegar, the acetic acid is always formed from alcohol by the action of the oxygen of the atmosphere upon it.

100 lbs. alcohol consist of

52.6 lbs. carbon.
12.9 lbs. hydrogen.
34.5 lbs. oxygen.
<hr/> 100.0 lbs. alcohol.

Concentrated acetic acid, the hydrate, consists in 100 lbs.

40.6 lbs. carbon.
6.6 lbs. hydrogen.
52.8 lbs. oxygen.
<hr/> 100.0 lbs.

It contains therefore the same constituents which form alcohol, but in a different proportion; less carbon and hydrogen and more oxygen. According to this composition acetic acid might originate from alcohol in three different ways: either, first, from its being deprived of a part of its carbon and hydrogen, while the oxygen remained the same; or, secondly, the carbon remaining the same, a portion of hydrogen being taken away, and oxygen added; or, thirdly, the hydrogen being left unaltered, and carbon and oxygen added.

There is no analogous fact in chemistry for the last of the three cases mentioned; it is therefore not probable that acetic acid is formed in that manner.

Till within a short period it was considered that the acetic acid was formed in the manufacture of vinegar in the manner specified in the first case; that, for instance, the oxygen of the atmosphere combined with a portion of the carbon of the alcohol to form carbonic acid, and with a portion of the hydrogen to water, and indeed with exactly those quantities of the two substances that vinegar remained. According to this, 100 lbs. of alcohol would have been deprived of 26.1 lbs. carbon and 8.6 lbs. hydrogen, when a compound of 26.5 lbs. carbon, 4.3 lbs. hydrogen, and 34.5 lbs. oxygen, that is, acetic acid, would be left. Were this true, 100 lbs. alcohol should afford 65.3 acetic acid.

More recent experiments, especially those of Döbereiner made with platina, have however proved that in the process of the formation of vinegar no carbonic acid is formed, and it may therefore be considered as proved that acetic acid is produced according to the



second form. To Prof. Liebig we are indebted for a more accurate insight into this curious process. He showed that, in the formation of vinegar, the acetic acid is derived from the alcohol by the oxygen of the atmospheric air depriving the alcohol of a portion of its hydrogen, forming with it water; and that then to the alcohol partially deprived of its hydrogen, which is termed aldehyde, and which contains carbon and hydrogen in quite the same proportions as the acetic acid, but less oxygen, the deficient quantity of oxygen is likewise conveyed to it by the atmosphere.

To 100 lbs. alcohol, which consist of

52.6 lbs. carbon,  
12.9 lbs. hydrogen,  
34.5 lbs. oxygen,

the air first conveys 35.2 lbs. oxygen, which combine with  
4.4 lbs. hydrogen of the alcohol, and form  

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39.6 lbs. water.

There remains a compound of

52.6 lbs. carbon.  
8.5 lbs. hydrogen.  
34.5 lbs. oxygen.  

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95.6 lbs.

This combination is aldehyde, and to this are now added from the atmosphere 33.9 lbs. oxygen, which produces a combination consisting of

52.6 lbs. carbon.  
8.5 lbs. hydrogen.  
68.4 lbs. oxygen.  

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129.5 lbs.

This combination is acetic acid (the hydrate), which dissolves in the water present.

100 lbs. of alcohol can therefore produce  $129\frac{1}{2}$  lbs. acetic acid, but this amount is never obtained in practice on account of unavoidable losses. If there be not a sufficient quantity of oxygen present, no acetic acid is formed, but only aldehyde. Since 100 lbs. air contain 23 lbs. oxygen, 300 lbs. air (about 3600 cubic feet) are necessary to convert 100 lbs. alcohol into acetic acid, as these contain exactly the requisite quantity, viz. 69 lbs. oxygen. In practice, however, the quantity of air must be far more considerable, as it is not wholly deprived of its oxygen.

From what has been above stated with respect to the origin of acetic acid, it might appear that alcohol, if exposed to the atmosphere, would be immediately converted by the oxygen into acetic acid. But this is not the case; it is well known that spirits may be kept for any length of time without their becoming acid and being changed into vinegar. There must be a coincidence of certain circumstances to induce the oxygen of the atmosphere to act upon the alcohol and to convert it into vinegar. Such are the following:—



1. The alcohol must be diluted with a considerable quantity of water. The liquid to be converted into vinegar should not contain more than 10 per cent. alcohol.

2. A so-called *acid ferment*, vinegar ferment, must be present. This has its name from the process of the formation of vinegar being also termed acetous fermentation, or vinegar fermentation. Numerous bodies which contain nitrogen may serve this purpose, such as gluten, mucus, *already formed vinegar*, and all substances which contain any of these ingredients, for instance yeast, sour dough, sour beer, but especially *sour bread soaked in vinegar*, &c. It is these substances, which, being in a state of inodorous putrefaction (decay, oxidation), draw the alcohol into the circle of their decomposition, or oxidation,—as it were infect it. Pure acetic acid cannot be employed as vinegar ferment, but only such vinegar as contains some of the substances above mentioned; this in general is preferable to all other kinds of ferment.

3. The temperature must not be too low nor too high; it must not be below  $+ 72^{\circ}$  Fahr. and not above  $113^{\circ}$  Fahr. The nearer the temperature approaches to the maximum, the more rapidly does the formation of vinegar proceed under otherwise similar circumstances, *i. e.* the more rapidly is the hydrogen oxidized.

It may therefore be said that—

*The formation of vinegar begins, when alcohol, diluted with much water, and with the addition of a sour ferment, is exposed to the action of the atmosphere from between  $72^{\circ}$  to  $113^{\circ}$  Fahr.*

This forms the basis of the manufacture of vinegar; the following additional considerations are important in practice:—

The higher the temperature, and the more atmospheric air that is conveyed in the shortest time to the liquid containing the alcohol and the acid ferment, the more rapidly does the process proceed. The more alcohol there is comparatively present, the stronger the vinegar obtained; for the alcohol is the material in the vinegar mixture from which the acetic acid is derived.

The highest aim in the manufacture of vinegar is evidently the conversion of the alcohol into acetic acid *as perfectly as possible* with the least loss of alcohol *in the shortest time*, and, it need not be mentioned, in the least expensive manner. How this object may be obtained has been indicated above, and of late this point has been so nearly attained by what is called the *quick process*, that scarcely anything is left to be desired.

As alcohol is the substance from which the acetic acid is produced, it is evident that any alcoholic liquid may be employed in the manufacture of vinegar. We merely call to mind that 100 lbs. alcohol can produce  $129\frac{1}{2}$  lbs. acetic acid. All substances therefore that can be made to undergo vinous fermentation, either because they contain sugar, or that sugar is formed in them from the starch, can be employed in preparing vinegar.

*Substances containing sugar* can be employed in the manufacture of vinegar when alcohol has originated by vinous fermentation from the sugar.



100 lbs. cane sugar give on fermentation 53·7 lbs. alcohol.

100 lbs. starch sugar give on fermentation 47 lbs. alcohol.

*Substances containing starch* can be used in the manufacture of vinegar after sugar has been produced by the process of mashing (by the action of diastase) from the starch, and when this has been converted into alcohol by fermentation.

100 lbs. starch give about 100 lbs. starch sugar.

According to these various origins the following kinds of vinegar are distinguished in commerce:—

1. *Wine Vinegar*.—It is prepared from wine, and contains therefore, together with acetic acid, all the other constituents of the wine, for example, tartaric acid; and it possesses a peculiar aroma, to which the pleasant smell is owing.
2. *Artificial Wine Vinegar*, or more correctly *Alcohol Vinegar*.—It is prepared from spirits, and consists almost solely of acetic acid, water, and a small quantity of acetic æther.
3. *Fruit Vinegar*, or *Cider Vinegar*.—It is prepared from the fermented juice of apples, and contains, besides acetic acid, malic acid, an acid to which apples and many other fruits owe, at least in part, their sour taste.
4. *Beer, Malt, or Corn Vinegar*.—It is prepared from a fermented extract of malt, and contains, besides acetic acid, nearly all the constituents of the beer, *i. e.* phosphates, gum, and extractive substances, by which latter it is more or less coloured, and froths when shaken.

Besides these kinds of vinegar, another occurs in commerce, *viz.* pyroligneous acid, or wood vinegar, which is formed by the destructive distillation of wood and many other substances; besides acetic acid, it contains empyreumatic oil, creosote, &c., from which it must be carefully purified previous to use. In this state it is employed in chemical manufactories for the preparation of various articles of commerce. Its formation is however due to a quite different cause, and does not come within the object of the present notice.

Many of the substances which are employed in the manufacture of vinegar, for instance wine, fruit and malt, already contain those ingredients which give rise to the formation of vinegar; they can therefore be converted into vinegar without the addition of any acid ferment, but the process is always hastened by the addition of vinegar, if only of a small quantity.

The alcoholic liquid which contains the requisite acid ferment, is called the *vinegar mixture*.

After what has been said with respect to the conditions under which vinegar is produced from alcoholic liquids, it will be evident that there can be only one way which can lead to the attainment of the object; but this may be reached in a longer or shorter time, and from this circumstance are distinguished two different methods of manufacturing vinegar, *viz.*

1. The *older* and *slow method* usually followed in England; and
2. The *new* and *quick method* followed in Germany, and known under the name of the *Schnellessig-fabrication*: of this method,



which is one of the most interesting to men of science, and to those occupied in the application of chemistry, we shall give an account in our next Number.

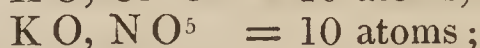
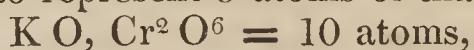
*Purification of Nitric Acid from Hydrochloric Acid, according to*  
M. ANTHON.

The crude acid which has been prepared from nitre containing salt, is boiled in a sand-bath until a sample is found to be free from hydrochloric acid. The nitric acid converts the whole of the hydrochloric acid into chlorine, which escapes.—Buch. *Rept.*, xxvi. p. 120.

## PROCEEDINGS OF THE CHEMICAL SOCIETY OF LONDON.

*Dec. 20th, 1842.*—(Prof. Brande in the Chair.) “On the Division by Three of the Equivalents of the Phosphorus Family of Elements;” by Prof. Graham. This family includes nitrogen, phosphorus, arsenic and antimony. The division of their received equivalents by three has been already advocated by M. Laurent, M. Bineau, and the author of the present communication, on various grounds. The new argument adduced here in its favour is founded on the thermal relations of two sets of salts.

1. Nitrate of potash and bichromate of potash, when taken in equivalent quantities, produce as nearly as possible the same depression of temperature, namely,  $3^{\circ}96$  Reaumur, according to the mode of conducting the experiment described in a former paper. Now these two salts will also contain the same number of atoms, namely 10, if the single equivalent of nitrogen of the nitrate of potash is supposed to represent 3 atoms of that salt:—



and the double chromic acid,  $\text{Cr}^2\text{O}^6$ , of the red chromates will correspond with nitric acid,  $\text{N O}^5$ .

2. Bisulphate of potash, binarseniate of potash, and terchromate of potash, appear likewise to produce all the same degree of cold on dissolving, about  $2^{\circ}26$  Reaumur. The terchromate of potash certainly contains 14 atoms. The other two are made to correspond with it in that respect, if the single equivalent of phosphorus and arsenic, which each contains, be supposed to be 3 atoms:—



“On the Sugar of the *Eucalyptus* of Van Diemen’s Land;” by Professor Johnston of Durham. Several species of *Eucalyptus* in Van Diemen’s Land furnish a kind of sugar or manna in tears or drops, which may be collected in considerable quantity; it is doubt-



ful however whether this be a natural exudation of the plant, or produced by the puncture of an insect.

The eucalyptus sugar has the following characters :—It is soft, opaque, and yellowish in colour, and inferior to cane sugar in sweetness; æther extracts from it only a small portion of wax; alcohol dissolves the whole with the exception of a little gum, and water leaves a mere trace of insoluble matter. From its hot alcoholic solution the pure sugar is deposited on cooling in distinct prismatic crystals arranged in radiating groups; it crystallizes also from its solution in water, but with greater difficulty.

When crystallized from alcohol, it gives on analysis the same composition as grape sugar, viz.  $C^{12} H^{14} O^{14}$ , or  $C^{24} H^{28} O^{28}$ , but its physical characters and relations to heat sufficiently distinguish it from that substance and approximate it to mannite. Heated to  $200^{\circ}$  or  $212^{\circ}$  this variety of sugar undergoes fusion and loses 5 equivalents water, while if the heat be gradually raised to  $180^{\circ}$  only, and that temperature maintained for 2 or 3 hours, it loses 7 equivalents water without melting, after which the dry powder may be heated to near  $300^{\circ}$  without any other change than simple fusion.

The author also describes a combination of eucalyptus sugar with oxide of lead, which compound is totally decomposed by boiling with water; in this case 9 equivalents of water appear to have been eliminated.

No mention is made respecting the fermentable properties of the new substance.

“Remarks on the Determination of Nitrogen in Organic Analysis;” by W. Francis. The presence of nitrogen in picrotoxine having been denied by all experimenters, the author was induced to repeat with great care the analysis of that substance, in the course of which researches abundant evidence of nitrogen was obtained. A few grains of pure picrotoxine, heated in a tube with a little of the mixture of lime and hydrate of soda, gave off vapours which quickly restored the blue colour to reddened litmus paper; the smell of ammonia was also quite distinct.

An analysis being made by the method of Messrs. Will and Varentrapp, in order to determine the amount of nitrogen, distinct yellow crystals of the double chloride of platinum and ammonium were obtained, corresponding in one experiment to 1·3 per cent. of nitrogen, and in a second to ·75 per cent.

Burned with oxide of copper, numbers representing the carbon and hydrogen came out closely corresponding to the results obtained by Regnault.

The observations of M. Reiset, in a late Number of the ‘*Annales de Chim. et de Phys.*,’ threw some doubts upon the value of the analytical method above mentioned, and the author was led in consequence to repeat the experiment on a specimen of carefully purified sugar, when a small quantity of a brownish black substance remained upon the filter after washing with the mixture of alcohol and æther. This, on being burnt, gave metallic platinum, indicating about ·3 per cent. nitrogen in the sugar.



In a second experiment the platinum indicated .2 per cent. nitrogen.

The author is disposed to doubt the existence of the yellow ammoniacal salt altogether in these precipitates, and to refer the substance to a decomposition of a little of the chloride of platinum by liquid hydrocarbon, which is always produced in this process when the substances submitted to analysis contain much carbon, and swims upon the surface of the acid liquid.

An analysis of oxamide by the new process gave an excellent result, the per-centage of nitrogen falling just below the theoretical quantity.

“On the probable existence of Nitrogen combined with Silicon in Soils and other Substances;” by W. H. Balmain. The stability of the compounds of boron and silicon with nitrogen, and the facility with which such compounds are produced when organic matter is strongly heated with a borate or a silicate, seemed to render it probable that such bodies might occasionally exist in unexpected circumstances, as in soils for example, and experiments were made with a view of directly ascertaining whether this was the case.

Samples of several varieties of soil were treated with dilute sulphuric and nitric acids for some time; then washed and dried, and subjected to the action of hydrate of potash at a high temperature. Ammonia was in all cases abundantly disengaged; even after the purified soil had been heated to redness, alkali discovered a trace of ammonia.

It was inferred that in these cases the nitrogen thus ultimately found had been in combination with silicon, and in that condition had resisted the action of the various agents employed for its removal.

## REVIEWS.

*On the Physiological and Medicinal Properties of Bromine and its Compounds, being the Harveian Prize Essay for 1842. By R. M. GLOVER, M.D.*

It would lead us too far into a different department of science were we to notice this Essay so fully as it deserves. A well-digested and thorough examination (and such a one is the present) of any active principle and its compounds, and their effects on the organized frame, must, in our opinion, prove of essential service to practical medicine. The subjects of this paper are arranged as follows:—

1. Of the Physiological Properties of Bromine and its Compounds—the Hydrobromic Acid, Bromides of Potassium, Sodium, Barium, Magnesium, Zinc, Iron, Mercury, Cyanogen and Olefiant Gas, with Bromoform, and of the analogies which they offer with Chlorine and Iodine, and their correspondent compounds. 2. Of the Medicinal part of the Inquiry. 3. General Conclusions.



We are certain that the readers of this Journal will be gratified by the perusal of the following extracts, which relate more especially to chemistry ; and that many, especially those connected with medicine, will turn with pleasure to the original Essay, which has been printed entire in the 'Edinburgh Medical and Surgical Journal,' No. 152.

"The idea of a relation," observes the author, "between the chemical and physiological properties of bodies, similar to that which exists between the external forms of many plants and the action of the same plants on the animal economy, has been more than once expressed. Mr. Blake, in his laborious and ingenious researches into the action of inorganic bodies introduced into the circulation, endeavours to connect the physiological properties of the bodies with their chemical relations viewed through the medium of the doctrine of isomorphism. In the present crude state of this doctrine, it appears to me more satisfactory to take into account the broad chemical analogies of bodies than their relations solely as to crystalline form. If some isomorphous bodies are similar in physiological action, there are others between which it would appear difficult to trace any great resemblance ; for example, the compounds of arsenic and phosphorus\*. Mr. Blake's statement, that the properties of a base are but little modified by combination with the strongest acids, if true, appears somewhat in contradiction with the prominence which he attaches to isomorphism as a guide to the physiological action of substances, for isomorphism is frequently to be traced as much produced by the acid as by the base. *Non omnia possumus omnes* ; and it seems to me that the valuable researches of Mr. Blake fall short of what this great question requires, since their author confines the chemical part of the question on the one hand, and that which relates to physiology on the other. He takes into account almost exclusively the effects of substances introduced directly into the circulation ; and many salts which are very different in general physiological properties, thus introduced, appear to produce very similar effects. Thus he has been led to connect potassa and its salts physiologically with ammonia and its compounds, rather than with the series of soda salts, which last-named group he places beside the salts of silver, following in this respect the isomorphous relations as guides. Now, in general chemical properties, potassa and soda, with their respective salts, are more allied than are the compounds of sodium and silver, and I venture to assert that this also holds good physiologically. With regard to the subjects of the present

\* I have experimented on rabbits with arsenic and phosphoric acids, and the alkaline arseniates and phosphates. 4 grs. of arsenic acid dissolved in 2 measured drs. of water and introduced into the stomach of a stout rabbit, killed the animal in 4 hours, with symptoms of strong irritant and corrosive action, and also of affection of the nervous system. 50 grs. of glacial phosphoric acid in the same quantity of water, similarly administered to a rabbit, supposed equivalent to the other, produced no effect. Great difference also appears to exist between the action of the alkaline arseniates and phosphates, so given to rabbits, the former being more irritant and acting more powerfully on the nervous system. These are, however, I conceive, exceptional cases ; but such exceptions are probably very numerous.



inquiry, not only are their beautiful chemical analogies to be traced throughout the group of halogenous elements and their compounds, but in general the chloride, bromide and iodide of a base are isomorphous."

In this view of the subject we agree entirely with the author; we are convinced that many bodies, isomorphous in their chemical relations, will be found to produce widely different effects on the organized tissues, leaving out of question the imperfect state of the doctrine of isomorphism at present.

The deadly effects of sublimate are well known, and it would be of importance to therapeutics to possess a compound less active than the chloride, and yet possessed of its general properties. The following notice we hope may lead to further experiments on the subject:—

"A French writer has insisted much on the greater mildness of the physiological action of the bromide in comparison with that of the chloride\*. I am willing to believe that its effects are not quite so great as those of the formidable and well-known salt, not so much from actual observation, which will scarcely bear out so nice a distinction, as from more general considerations. To come to the point at once, I am induced to frame a law to the effect, that among chlorides, bromides and iodides of electro-positive metals, the iodide is the most active physiologically, then the bromide, and lastly the chloride; but this law is inverted when we get to the electro-negative metals and their haloid salts. There the chloride is the most active, then the bromide, and lastly the iodide; thus in all cases the activity will be as the solubility of the salt, and as its facility of decomposition, according to what has been said of the affinities of chlorine, bromine and iodine for electro-positive and electro-negative substances.

"By way of example, the chlorides, bromides and iodides of potassium and sodium may be cited in support of one part of the proposition; the chloride and red iodide of mercury in support of the other. But as a still more marked example in support of the latter part of the proposition, take the chloride and iodide of platinum. I found the former of these salts, introduced in solution in a dose of ten grains into the stomach of a rabbit, to give rise to prostration of strength, slimy stools, abdominal respiration, and finally death in six hours, preceded by great feebleness of the heart's action. After death the stomach exhibited a uniform brownish gray corrosion over the cardiac portion. But the iodide in a dose of 15 grains, similarly administered to another rabbit, produced no effect.

"The sub-bromide is strictly analogous to calomel in physiological properties.

"Before concluding these observations on the action of the saline compounds of bromine, I may remark that we are yet completely in the dark whether any substances can obstruct the capillary circula-

\* M. A. Bonnet (*Bulletin Général de Thérapeutique*, Juillet 1837) maintains that the bromide is less apt than the chloride, during a long administration, to occasion pains of the head, chest and abdomen.



tion, but such as are capable of exerting a chemical action on the vessels or their contents."

After detailing a series of cases in which bromine or its compounds had been administered, the author sums up with the following remarks:—

"The cases, whose prominent features I have thus endeavoured to describe, can be only supposed to give the slightest possible foundation on which to frame inductions with regard to the real therapeutic power of bromine and its compounds. I should be induced to recommend the external use of bromine in scaly darts affections of a peculiarly inveterate character, and in specific and malignant ulcers where there is defective action: in the form of lotion the element furnishes an elegant and cleanly application. The solution is slowly changed by the action of light, the hydrobromic acid being formed. Oil skin should be employed to cover the lint in which the bromine is dipped, in order to prevent the evaporation.

"Internally the use of bromine must necessarily be very limited. The sensation which attends the swallowing of it is, I repeat, truly horrid. The bromide of potassium is less powerful than the iodide, and might perhaps be used with advantage where the latter is apt to disagree with the stomach. The bromide of iron is perhaps the most agreeable of the strong preparations of iron. I have prescribed it frequently as a general tonic, and in hysteria and leucorrhœa. I conceive it to be less liable to decomposition than the iodide. A most exaggerated notion has been entertained of its power."

The Essay closes with the following general conclusions:—

"1. Bromine appears to resemble chlorine much more than iodine in its physiological properties.

"2. All the bromides seem to bear a closer relation to the chlorides physiologically than to the iodides.

"3. The chemical and physiological relations of the group of halogenous elements and their compounds are in strict accordance.

"4. Although in general the compounds of chlorine, bromine, and iodine with metals appear to resemble other salts of the same bases in their action on the animal economy, yet we may perceive that the haloid salts are for the most part marked by peculiar resemblances.

"5. As far as we can observe, the class of medicinal agents which bromine and its compounds furnish, is intermediate in medicinal action between the two allied groups, but nearer that of chlorine than that of iodine."

## PATENTS.

*Patent granted to John Benner Lawes, of Rothamstead, Hertford, for certain Improvements in Manure.*

THE first improvement consists in decomposing bones, bone-ash, bone-dust, apatite, or phosphorite, and other phosphoric substances,



previous to using the same as manure, by mixing with them a quantity of sulphuric acid, sufficient to set free as much phosphoric acid as will hold in solution the undecomposed phosphate of lime. The free phosphoric acid is, by this means, enabled to unite itself at once with the various alkaline earths contained in the soil, and the undecomposed phosphate of lime is left in a state of more minute division than can be effected by mechanical means.

The second improvement relates to manures for soils which are deficient in any particular alkali, and consists in manufacturing the manure by mixing phosphoric acid with the alkali required.

The third improvement relates to the formation of manure for those soils from which a crop of wheat, or any other plant whereof silica forms an essential component part, is desired to be raised. The manure consists of a mixture of silica in the state of ground flint, sand, crystal, or glass, with either of the alkalies, potash or soda.—Sealed May 23, 1841.

*Patent granted to Sir James Murray, Dublin, for an improved Method of combining various Materials, in a Manner not hitherto in Use, for the purpose of Manure.*

The main object of this invention is to produce a compound, which, when mixed with the earth or soil, will generate within it carbonic acid, and a variety of useful salts, and thus increase the supply of nutriment for vegetables, and improve the quality of crops generally.

The means employed by the patentee for effecting this improvement consist in drying up and solidifying phosphoric acid and the common mineral acids, by mixing them with dry, porous and absorbent matters, vegetable, animal or mineral, such as bran, saw-dust, malt-dust, husks of seeds, brewers' grains, ground rags, pulverized rape or linseed cakes, refuse of flax, leaves and bark of trees, dry tan, siliceous sands, peat or other sandy mould, dry earth, finely sifted cinders, and other like substances. When the acids are absorbed by any of these matters, and converted into powder, they may be more advantageously combined with alkaline substances, and worked into the ground in a dry state; the chemical action above mentioned taking place afterwards, when excited by the moisture present in the soil, or which may subsequently fall upon it.

The acids used by the patentee are phosphoric, nitric, muriatic and sulphuric; the nitric acid being reduced to a uniform specific gravity of 1.200, and the sulphuric acid to 1.600.

The acidulous compounds or powders, which are produced from the acids, and afterwards mixed with alkaline substances, previous to their being used as manure, are 5 in number, viz. phosphoric compound or powder, acidulous nitric powder, acidulous muriatic powder, acidulous vitriolated powder, and consolidated acid compound.

The phosphoric compound or powder consists of an equal weight of apatite or phosphorite, and sulphuric, or any other of the acids,



which are mixed together and agitated in an earthen vessel for two or three days; the mixture is then converted into compost by the addition of a sufficient quantity of some of the absorbent matters.

The acidulous nitric powder is made by mixing nitric acid with a sufficient quantity of absorbent matter to form a dry compost; and when it is to be used as manure, an equal weight of powdered sulphate of lime is combined with it, and the mixture is packed in casks or earthen jars, from which the air is carefully excluded.

The acidulous muriatic powder is composed in the same manner as that just described, with this exception, that muriatic acid is substituted for the nitric acid.

The acidulous vitriolated powder is produced by mixing sulphuric acid with enough absorbent matter to form a dry powdery compost; and to this compost, when required for agricultural purposes, an equal weight of dry powdered acidulous sulphate of soda, and also a like quantity of dry powdered acidulous sulphate of potash, are added.

The consolidated acid compound is formed by combining together two or more, or even all the acidulous powders before described.

The alkaline substances with which the acidulous powders are to be mixed, are the supercarbonates, carbonates, and even subcarbonates of soda, potash and ammonia, and also the carbonate of lime. These substances the patentee prefers to mix together in equal quantities, and thus produce what he calls the alkaline mixture, which is combined with any of the acidulous powders in equal quantities, and is then termed the fertilizing compost or powder.—Sealed May 23, 1841.

*Patent granted to George Lowe, of No. 39, Finsbury-circus, for improved Methods of supplying Gas under certain circumstances, and of improving its Purity and illuminating Power.*

The first improvement consists in the application of mechanical means for giving a power of moving gas-meters beyond what is produced by the flow of gas through them, in order to prevent a deficiency in the supply of gas occurring at any time.

The axis or shaft of the meter is elongated, and on the end of it a common-shaped water-wheel is fastened, being inclosed in a case, the feet of which correspond with the feet of the meter, and the lower part of the case is cut away, so as to allow the space covered by the feet to form a receiver or race for the water, which is thence carried away by a pipe.

When it is desired to increase the moving power, in order that a larger quantity of gas may pass through the meter, water is introduced into the water-wheel case through a funnel at the top of it, and by that means the water-wheel is caused to revolve, and the additional moving power is obtained. Instead of the water-wheel a weight may be used for the same purpose.

The second improvement consists in increasing the surface of the gas-wheel, or that part of the meter which measures the gas, by



fastening around its circumference a rim or covering, about an inch larger in diameter, in order to augment its saturating power, when charged with naphtha or other hydro-carbonaceous liquid, as proposed in a former patent, obtained by the present patentee in 1832, and also to make it act the part of a purifier, when charged with a solution of caustic potash or soda, instead of water or other fluids, as usual.

The third improvement consists in saturating the gas in a separate vessel, instead of in the meter.

The vessel is made of tin or other suitable material, and is divided in the centre by a partition, on each side of which are three shelves or wire gratings, and on each shelf a stratum of sponge or other suitable material is placed. The sponges on one side of the partition are saturated with a solution of caustic potash or soda, which is introduced through a funnel at the top of the vessel, and falling upon a perforated shelf or colander is equally distributed over the surfaces of the sponges. The sponges on the other side of the partition are in like manner saturated with naphtha, and the gas being admitted into the vessel, underneath the sponges containing the caustic alkaline solution, passes upwards through the same, and proceeding through an opening in the top of the partition, descends through the sponges containing the naphtha, and passes out near the bottom of the vessel.

By passing through the caustic alkaline solution, the sulphuretted hydrogen and carbonic acid is extracted from the gas, and by passing through the naphtha the illuminating power of the gas is increased. If the extraction of ammonia from the gas is the object, a solution of diluted acid, such as sulphuric, muriatic, or any other suitable acid, is substituted for the alkaline solution; or if the vessel contain three sets of shelves, divided from each other by partitions, the three operations may be carried on simultaneously.

The same effects are likewise produced by causing the gas to pass over the surfaces of naphtha, or the other fluids above-mentioned, contained in a series of shallow trays.—Sealed Sept. 16, 1841.

*Patent granted to William Thompson Clough, of St. Helens, Lancashire, for Improvements in the Manufacture of Carbonates of Soda and Potash.*

This invention has for its object, first, the use of silica, to neutralize the causticity of the salts of soda and potash, and thus to facilitate the obtaining crystals of carbonate of soda; and, secondly, to obtain carbonate of soda or potash, in combination with silicate of soda or potash, by which means the properties of the carbonate of soda or potash will be materially enhanced, and rendered more useful for bleaching purposes.

In making carbonate of soda according to these improvements, a quantity of silica is thrown into the furnace with the alkali (soda or potash) in the process of manufacture, in such proportions as to be sufficient to saturate the caustic alkali it may contain, and thus con-



vert it into silicate of potash or soda. The silica is likewise added to the alkaline liquor in the "boiling-down furnace;" or, by preference, when, for soda-ash or potash of commerce, from 10 to 15 per cent. of the silica is mixed with the salts from the boiling-down furnace by means of a shovel or other instrument; and the combined materials are thrown into the carbonating furnace, and finished in the ordinary manner.

The same methods are pursued for making salts of potash, except that 7 per cent. of silica only is added, instead of 10 per cent.

In the process of crystallizing the carbonate of soda, the resulting "mother salts" from the residual liquor retain the whole of the silicate of soda, whilst the larger part of the carbonate separates in crystals nearly pure and colourless.—Sealed Sept. 17, 1841.

*Patent granted to John William Neale, of William Street, Kennington, and Jacques Edouard Duyck, of Swan Street, for certain Improvements in the Manufacture of Vinegar.*

This vinegar is made from beet-roots. The tops and shoots of beet-roots are first cut off, and the roots, after being thoroughly washed, are rasped into a fine pulp, with which a number of bags made of strong cloth are filled; these bags are placed in a powerful press, with a board or hurdle between every two, and are subjected to pressure until the whole of the saccharine juice is extracted from the pulp. The strength of this juice will vary from about 7° to 9° of the areometer, and must be reduced by the addition of water to 5°, and then boiled for a short time. The liquid, or "worts," is now removed to the coolers, in which it remains until the temperature falls to 60° Fahr. It is then conveyed to the fermenting vat, half a gallon of good yeast being added to every 100 gallons of wort. When the fermentation is ended, the fermented wash is pumped into the acidifying vessel, and is there converted into vinegar, as will be presently described.

The acidifying or air-forcing apparatus consists of a strong vat capable of containing 24,000 gallons; in the centre of which, a short distance above the bottom, a rose or small inverted dome is fixed, pierced with numerous small holes, and communicating by a pipe with a blowing apparatus. Upon the bottom of the vat a steam worm lies, one end of which is connected to a steam-boiler, and is furnished with a steam-cock, and the other end is open to the atmosphere. The interior of the vat is divided into several compartments, by means of diaphragms or false bottoms, pierced with small holes, and the cover of the vat is provided with a valve, which opens outwards upon a very slight pressure from within. The vat is likewise furnished with a thermometer, the bulb of which is immersed in the liquid contained in the vat, in order to indicate the temperature of the same.

The following is the mode of converting the fermented wash into vinegar by means of this apparatus:—2000 gallons of vinegar are first let into the vat, to serve as "mother" to an equal quantity of



fermented wash, which is introduced at the same time, and a little yeast being added, the whole quickly enters into the acetous fermentation. When the fermentation is fully set in, air is forced into the vat by the blowing apparatus, which air, in its passage through the small holes in the false bottoms, is brought into intimate contact with the liquid, imparting to it a portion of its oxygen, and expelling through the valve in the cover the carbonic acid gas evolved during the course of the fermentation. As soon as the temperature of the liquid falls below  $70^{\circ}$  Fahr., a current of steam is admitted into the worm, so as to maintain the temperature constantly between  $70^{\circ}$  and  $80^{\circ}$  Fahr.

By this means the liquid will in a few days be converted into vinegar; and when that is effected, 4000 gallons more of fermented wash are let into the vat, and the above process being continued, the whole 8000 gallons will in a few days be converted into vinegar. This process is continued until the vat contains 24,000 gallons of vinegar, and when the acetous fermentation has ceased, 8000 gallons are drawn off and clarified by the ordinary means. 8000 gallons of fresh wash being now pumped into the vat, will in a few days become completely acidified, and that quantity of vinegar may be withdrawn from the vat, and replaced by a like quantity of fresh wash, and so on continuously.

*Claim First.*—The improved process and apparatus for manufacturing vinegar from beet-roots.

*Claim Second.*—The process and apparatus for effecting and maintaining the acetous fermentation, and all such modifications of the same, wherein the acetous fermentation is conducted by the combined operations of an air-forcing apparatus and steam heat, applied in pipes or vessels within the acidifying vessel; whether the process of conducting the acetous fermentation be applied to the making of vinegar from beet-roots, or any other substances.

*Claim Third.*—The application of an air-forcing apparatus in the manufacture of vinegar, or acetous acid, distinctly considered from the other parts of the apparatus.—Sealed Sept. 8, 1841.

*Patent granted to Samuel Oliver, Pennsylvania, for an Improvement in the Process of Distilling.*

This improvement, the patentee says, “consists in the introduction of wood ashes, lye, or potash, or either of them, into combination with the rye, corn or other grain, after it has been mashed, and before the process of fermentation commences, and mixing it with the same in the proper proportions.”

*Claim.*—“What I claim as my invention, discovery and improvement, and desire to secure by letters patent, is, the application of wood ashes, lye or potash, to the process of distillation of rye, corn, or other grain, into whiskey or alcohol, for the purpose of retarding the acetous fermentation and increasing the yield.—Sealed August 4, 1841.



# THE CHEMICAL GAZETTE.

No. VII.—Feb. 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*Notice relative to Poisoning by Hydrocyanic Acid. By M. A. MORIN, Pharmacien.*

AMONG the numerous applications of the science of chemistry, few of late have more excited public attention than the investigations relating to medico-legal chemistry, and to the discovery of the proofs which this science is able to furnish in cases of poisoning. In our opinion it has been too much occupied with it, and it seems to us that there must remain, after all the public discussions to which some recent trials in cases of poisoning by arsenic have given rise, a kind of uncertainty which must be a cruel torment to those men who are called upon to pass judgement on the lives of their fellow creatures. The wonders of Marsh's apparatus, the terrible theory of arsenic being present in the normal state of the body, which had afterwards to be renounced, the doubts publicly raised on the possibility of the tests used by the chemists themselves containing the poison furnished by the analyses, all must have contributed to throw doubt on the certainty of the data which were believed capable of establishing the presence of this dangerous metal.

At the present time another poison has come into fashion, which is quite as dangerous, although less easily procured—prussic or hydrocyanic acid. Information of a case of poisoning having been laid, a body was taken up and examined 7 days after death; skilful chemists thought that they could discover distinct indications of the presence of prussic acid in the organs, manifested especially by the smell of bitter almonds it is known to possess, and the accusation assumed a formidable shape. The medical men consulted affirmed that the saturation of all the organs by this subtle poison led to the supposition that it was introduced during life, and they therefore concluded that it was the cause of death.

A certain number of physiologists and chemists of Geneva were called upon to examine the questions which these conclusions gave rise to, and the results which they arrived at, which agreed moreover with those of M. Orfila, who had also been consulted, threw great doubt on their correctness.

The numerous experiments they made on living animals proved that the smell was not sufficient to decide upon the presence of hy-



drocyanic acid in a dead body. In several cases where this acid had been the undoubted cause of the death of an animal, it could not have been recognised upon inspection after death. In general the smell was more characteristic when the poison had been mixed with alcohol, and was particularly remarkable when the essences of cherry-laurel, or of bitter almonds, had been employed. They also ascertained that 5 or 6 days after the introduction of prussic acid into animals, the dead bodies of which were preserved at a low temperature, it was frequently impossible to detect any trace of the poison introduced, so quickly does it disappear if administered alone. They found that it might penetrate all the organs of the dead body of an animal into which it had been injected after death by strangulation, and that this penetration does not require the help of vital phenomena in order to be effected. In short, they thought they could perceive a possibility either of the transformation of vegetable substances capable of producing it into prussic acid, as kernels or liquids which contain them, and which had been taken for too long a time, or from the spontaneous production of this acid during life under the influence of some morbid affection, a production which some medical facts appear to prove, or after death by means of fermentation.

These facts are in themselves interesting, independent of the particular circumstance which occasioned their discovery; and although we are ignorant of the influence which they may have had on the judgement in the trial of which they formed one of the elements, we think it useful to make them known in order to put practitioners in medico-legal chemistry on their guard against the dangers of even the most conscientious examination of a question if not undertaken in all its bearings.—*Bibliothèque Universelle de Genève*, Dec. 1842.

*On the Chemical Composition of Human Bones.* By Dr. FRERICHS.

The results of all former researches as to the relative amount of the organic and inorganic substances in the bones from various parts of the body of the same individual, and also in those from persons of different age, differ considerably. Thilenius, Schreyer, Rees, Sebastian and Valentin disagree entirely. Dr. Rees, who has instituted the most complete inquiries on this subject, determined the amount of inorganic substances far lower than most of the others. It was therefore desirable to repeat the experiments, which were made under the direction of Prof. Wöhler, in the following manner:—

The bones for examination were carefully cleansed, and the membrane scraped off; they were then pounded, the medullary fat extracted with æther, and now dried in an oil-bath at 266° to 286° Fahr. Thus prepared, the bones might be easily reduced to a fine powder. They were dried till no longer any loss in weight occurred, a certain amount weighed off, calcined in a platinum crucible, the carbonic acid which might have escaped in this operation again restored by



gently warming with carbonate of ammonia, and the whole then weighed again.

In the choice of the bones, both those in which a portion of the cartilage had been destroyed by the maceration in lime (which occurs frequently in young bones), as also those which contained in their cavities parts of the lime in which they had been macerated, were carefully avoided. Those bones to which "full-grown individual" is attached, belonged to the same person. The cortical and medullary substance were taken equally for the analyses.

	Inorgan- ic consti- tuents.	Organic consti- tuents.
Os parietale of a full-grown individual . . . . .	68·5	31·5
... of a child 3 years old . . . . .	66·3	33·7
Pars petrosa ossis temporum of a full-grown individ.	70·2	29·8
Maxilla inferior do. do.	68·0	32·0
... of a child 3 years old . . . . .	62·8	37·2
Sternum of a full-grown individual . . . . .	64·7	35·3
Costa do. do. do. . . . .	65·3	34·7
Humerus do. do. do. . . . .	68·3	31·7
Humerus and ulna of a foetus 8 months old . . . . .	63·2	36·8
Radius of a full-grown individual . . . . .	66·3	33·7
... of a youth 10 years old . . . . .	66·5	34·5
Tibia of a full-grown individual . . . . .	66·2	33·8
Fibula do do. do. . . . .	66·5	33·5
Carious excrescences of another fibula . . . . .	61·2	38·8
Os metatarsi of a full-grown individual . . . . .	65·9	34·1
Patella do. do. do. . . . .	68·7	36·3
Corpus vertebræ lumborum do. do. . . . .	60·5	39·5

From these analyses it may be concluded,—

1. That the amount of lime in the bones of various parts of the body of one individual varies considerably.

2. That it decreases in inverse ratio with the amount of medullary canals and cavities, and therefore that the spongy bones contain less inorganic substances than the compact ones. It is not probable that the amount of cartilage is greater in a spongy portion of a bone than in the compact, for the lime salts are conveyed through the vessels which are situated in the medullary cavities and vessels.

3. The inorganic constituents increase with age, but not to such an extent as stated by Schreyer.

4. That the quantity of lime salts in bones is far more considerable than announced by Rees and others, who, as Berzelius suspects, did not in drying entirely remove the water which the bones retain so tenaciously, and added it in their calculations to the amount of organic constituents, which decreased the amount of salts of lime.

The following experiment was made to find out in what manner the carbonate and phosphate of lime were arranged in the bone sub-



stance, whether perhaps the former occurred only in the osseous body, and the latter in the structureless intermediary substance, or *vice versâ*. A plate of bone was scraped so thin that the osseous bodies and their radiate ramifications might be distinctly recognised; the cartilage was carefully extracted with a weak solution of caustic potash, the plate cleansed and moistened with a solution of nitrate of silver, and now brought under the microscope. The whole of the substance had become equally coloured yellow, a proof that carbonate and phosphate are distributed everywhere alike.

To decide whether, in the structureless intermediary substance of the bones, the lime salts are contained mechanically in the cartilage, just as they are deposited free in the osseous bodies, or whether they have entered into a chemical combination with the cartilage, an attempt was made to prepare a similar compound artificially. For this purpose a solution of basic phosphate of lime in hydrochloric acid was added in small quantities to a dilute solution of common gelatine, the acid saturated with ammonia, the precipitate filtered, carefullyedulcorated with boiling water, dried and burnt. The precipitate contained in 100 parts—

81·4 basic phosphate of lime, and  
18·6 gelatine.

On repeating this experiment with gelatine prepared from bone cartilage, the solution of which was mixed in excess with the solution of bone-earth in hydrochloric acid, and then thrown down with ammonia, the precipitates from three different preparations contained 28·2, 27·4, 24·4 per cent. gelatine. These proportions seem therefore to indicate that the intermediary substance of the bones consists of a chemical combination of bone-earth with the gelatinous matter. Taking Mulder's atomic weight of gelatine for basis, a compound of 1 atom of bone-earth and 1 atom of gelatine should contain 26·2 per cent. gelatine.

To determine whether the relative proportions between carbonate and phosphate of lime are the same in the spongy and in the compact bones, analyses were made of both kinds which had been taken from the same individual. The following results were obtained.

Two different *spongy* bones contained in 100 parts—

	I.	II.
Organic substance . . . . .	38·22	37·42
Phosphate earths . . . . .	50·24	51·38
Carbonate of lime . . . . .	11·70	10·89
	<hr/> 100·16	<hr/> 99·69

Two different *compact* bones contained—

	I.	II.
Organic substance . . . . .	31·46	30·94
Phosphate earths . . . . .	58·70	59·50
Carbonate of lime . . . . .	10·08	9·46
	<hr/> 100·28	<hr/> 99·90



*Solubility of Fibrine and coagulated Albumine in Hot Water.*

L. Gmelin has stated that coagulated albumine dissolves in water at about  $390^{\circ}$ . Wöhler and Vogel have found this solution to take place already at  $300^{\circ}$  in experiments with sealed glass tubes in the oil-bath; the solution behaves like uncoagulated albumine. At  $390^{\circ}$  the solution proceeds more rapidly, but not without some decomposition. Fibrine from blood and muscular fibre digested in water behaved precisely in the same manner. Acids produced a precipitate in the solution; the precipitate with acetic acid was soluble in an excess of the acid.—*Ann. der Chem. und Pharm.*, lxi. p. 238.

*On Urea and the Constituents of the Gall in the Blood.*

By J. FR. SIMON.

The author was always able to detect urea in the blood of those patients who were afflicted with Bright's degeneration of the kidneys. 2 to 3 oz. of the blood were precipitated with alcohol, the filtered solution evaporated to the consistence of a syrup, and again treated with absolute alcohol until the extract dissolved to a clear liquid in spirits of wine. It was then evaporated to dryness, the residue treated with water, and the fat separated, the filtered liquid evaporated, the residue mixed with cold nitric acid, and the formation of the rhombic prisms of the nitrate of urea observed under the microscope; they are always entirely soluble in alcohol.

In the blood of a person suffering of cholera there was so much urea that it crystallized from the alcoholic extract in needles, which were distinctly visible under the microscope, even without treatment with nitric acid. The same blood also contained biliverdine, and so much biline, that, on treating the alcoholic extract with sulphuric acid, globules of bilifellic acid were distinctly seen to separate. The cholera blood examined contained in 1000 parts 750.530 water, 2.470 fibrine, 5.434 fat, 114.114 albumine, 106.529 hæmatoglobuline, 10.631 extractive matter, salts, urea, and constituents of the gall. 100 parts of the serous residue contained 5.41 combustible salts.

The author found the blood of an icteric person to abound in biliphæine, so that the serum appeared of a blood-red colour; there was also some gall-resin in it, but no biline nor bilifellic acid.

In the healthy blood of a calf the author proved the existence of urea in the following manner:—From 15 to 16 lbs. of blood were agitated with several quarts of alcohol, collated through linen, then pressed; the liquid which was obtained again treated with alcohol, the spirituous liquid partially distilled off, the residue evaporated to the consistence of a syrup, again treated with alcohol of 0.848 sp. gr., the filtered liquid evaporated and treated repeatedly with alcohol until the whole dissolved to a clear solution. The solution was now diluted with absolute alcohol, some weak sulphuric acid, and so much absolute alcohol added until the whole of the bases which had been combined with fat acid and lactic acid were precipitated as



sulphates. After standing for several days it was filtered, and the solution freed from sulphuric acid by the addition of some carbonate of barytes, again filtered and evaporated, and the fat and fat acids separated by means of water. In the residue remaining after the evaporation of the aqueous fluids, urea could not be decidedly proved under the microscope by nitric acid. The greater portion of the extract to which nitric acid had been added, was now dried over sulphuric acid under a bell-glass, the residue treated with alcohol, the alcoholic solution left to evaporate spontaneously, and the residue brought under the microscope, and now nitrate of urea could be distinctly recognized. When a solution of common salt was added to the alcoholic extract of the calf's blood, it appeared on crystallization partly in cubes, partly in octahedrons; but the octahedral crystallization of salt cannot be regarded as a certain criterion for urea, as it is also caused by other extractive matters.—Müller's *Archiv*, 1841, p. 454.

### *Smell of Quinces.*

Quinces have, as is well known, a peculiar odour, especially the rind, which very much resembles that of cœnanthic æther. Wöhler distilled the parings of 40 ripe quinces with water. On the surface of the product, which had a very strong smell and taste, some small globules of oil collected, which possessed an intensive odour of quinces. A similar oil passed over on distillation with solution of caustic potash; the potash solution, which had become free from smell, became turbid on saturation with sulphuric acid; on being warmed, a fluid fat void of smell, and easily soluble in caustic potash, separated. The rind of quinces appears therefore in reality to contain cœnanthic æther.—*Ann. der Chem. und Pharm.*, xli. p. 240.

### *On the artificial Preparation of the Camphor of the Laurineæ.*

The peculiar camphor-like smell of several essential oils induced M. Rochleder to examine whether this was not owing to their conversion into camphor by the action of the oxygen of the atmosphere, in which case it was to be expected that the same change might be effected by other oxidizing bodies. Those indifferent oils which are free from oxygen, and which moreover contain carbon and hydrogen in the same atomic proportions as camphor, appeared best suited for this purpose. The author treated the oil of *Valeriana officinalis* and oil of turpentine with nitric acid. Oil of Valerian is a mixture of two different bodies, one of which contains no oxygen, and is isomeric with oil of turpentine. When the crude oil is mixed with nitric acid, the whole assumes a blue colour, which was observed long ago by Bonastre; no oxalic acid, as asserted by him, could be detected, but the mass soon becomes yellow and more consistent. On the continued application of heat an oil distils over along with the nitric acid, which, on being shaken with much water, solidifies, and was found to be nitrate of camphor. The camphor



obtained in this manner from the crude oil is accompanied by several other products, which owe their origin to the action of the nitric acid on the oxygenous constituents of the crude valerian oil, a volatile body which brings tears to the eyes, and a yellow less volatile body, which dissolves in a solution of caustic potash with a red colour. A yellow aromatic, adhesive resin remains along with the nitric acid, which is partially dissolved by the acid with a red colour, and is precipitated from this solution by water.

To purify the camphor thus obtained, it must be washed with an aqueous solution of potash, and freed by pressure between bibulous paper from the adherent colouring substance. It is then distilled over a highly concentrated solution of caustic potash and dissolved in alcohol, from which it is precipitated by water, dried by pressure between blotting-paper mixed with pulverized freshly-fused chloride of calcium, and sublimed. When the crude valerian oil is previously distilled with caustic potash, the above products are not formed, with the exception of a small quantity of a yellow resin, which on distillation remains along with the nitric acid.

An analysis of the artificial camphor gave—

	Found.	Atoms.		Calc.
Carbon.....	78.84	= 10 =	758.54	79.15
Hydrogen ....	10.44	= 16 =	99.83	10.42
Oxygen .....	10.77	= 1 =	100.00	10.43
	<hr/> 100.05		<hr/> 958.37	<hr/> 100.00

The indifferent oil of valerian =  $C^{10} H^{16}$ , needs for its conversion into camphor 1 atom of oxygen, which is afforded by the nitric acid. The camphor so formed combines with the excess of nitric acid present to nitrate of camphor, which, on being brought into contact with water, is decomposed into camphor and dilute nitric acid.

On submitting oil of turpentine to the same treatment, not a trace of camphor could be detected among the products of oxidation.

The author also examined the oil of *Salvia officinalis*, and obtained from it a considerable quantity of camphor.

This oil is also a mixture of several bodies. By fractioned distillation the author obtained two different oils, one having a burning taste and smelling of sage and of camphor, which corresponded to the formula  $12C\ 20H\ 1O$ , the same therefore as that of the crude peppermint oil according to Sell and Blanchet; and one represented by the formula  $18C\ 30H\ 2O$ , which is that advanced by Völkel for the less volatile constituent of the worm-seed oil. By distillation with hydrate of potash, he obtained products corresponding to the formulæ  $22C\ 40H\ 1O$ ,  $30C\ 50H\ 1O$ ,  $60C\ 100H\ 3O$ , and  $22C\ 40H\ 2O$ ; hydrogen is given off and carbonate of potash remains behind. From these experiments it would seem that the oil of salvia =  $C^6 H^{10}$  plus a variable quantity of oxygen. When it is brought into contact with cold concentrated nitric acid, or with warmed dilute nitric acid, it becomes brownish red, with a considerable evolution of heat and abundant liberation of gas, while the oil is converted into a red resinous mass, which consists of a



yellow resin soluble in solution of caustic potash with a red colour, a little unaltered oil, and nitrate of camphor. On distilling this mass with water, camphor is obtained contaminated with a peculiar-smelling oil and a yellowish-red brittle resin.

When sage oil is added by degrees to boiling fuming nitric acid, a considerable quantity of carbonic acid and nitric oxide gas is given off, and the temperature is much raised; the oil dissolves for the greater part in the nitric acid, and colours it red. When this solution, mixed with 4 times its volume of water, is boiled, and the vapours passed through a cold tube, the camphor is deposited on its sides, and may be purified in the manner above described. It was found to consist of  $10\text{C } 16\text{H } 1\text{O}$ .

The origin of the camphor from the oil of *Salvia officinalis* by the action of nitric acid is easily explained. Take from

$\text{C}^{12} \text{H}^{20} =$  carbon and hydrogen of the oil,

$\text{C}^{10} \text{H}^{16} =$  carbon and hydrogen of the camphor,

and  $\text{C}^2 \text{H}^4$  remains, which combine with the oxygen of the nitric acid to form carbonic acid and water, together with formation of nitrous acid. Ettling arrived at the same result some time since with regard to valerian oil, and M. Gerhardt has recently published an account of the conversion of the indifferent oil of valerian, by means of hydrate of potash, into the camphor of *Dryobalanops camphora*, and the conversion of this into the camphor of *Laurus camphora*, which we shall have occasion to notice in our next Number.

### Prize Questions.

The programme of the *Société Hollandaise des Sciences à Haarlem* for the year 1842 contains the following prize questions, which relate to chemistry, and which we presume will be interesting to our readers. They should be answered before the 1st of January 1844.

1. According to numerous experiments of several scientific persons whom the *Académie des Sciences* had commissioned to examine the nutritive properties of bone gelatine, this alone is entirely insufficient for the nutrition of man, all other food being excluded. On the other hand, it appears to be proved in the Netherlands, that the soups which are there during winter time distributed among the poor, and of which the principal constituent is bony gelatine, affords an excellent nutriment. The Society wishes that these two facts should be subjected to fresh inquiry, and that especially the latter should be confirmed or refuted by decisive experiments.

2. Examination of the atmosphere in the Netherlands.

3. A physiological, anatomical, and microscopical examination of *Leontodon taraxacum*, L., in the various periods of its growth.

4. Do plants absorb nitrogen from the atmosphere? Through what organs does this absorption take place, and in what relative quantity? What influence has the absorbed nitrogen upon the development of vegetables, and on their chemical composition?

5. The Society, convinced that the accurate knowledge of the



amount of aqueous vapour which plants give off would add much to the advancement of meteorology and climatology, requires that the amount of this water should be determined by numerous and accurate experiments.

6. According to the observations of several scientific men, the inorganic substances are solely transformed through the intermediation of plants into organic combinations, and this change is accompanied by a separation of oxygen, while no other substances than those prepared by plants could serve for food to animals, the assimilation of which is, on the contrary, accompanied by an absorption of oxygen. It is asked, whether a fact of so much importance is sufficiently supported by observations, facts, and satisfactory proofs, or whether it must be considered to be hasty, doubtful, and not sufficiently proved.

7. A full and accurate history of the native compounds of chlorine with the metals, applied to geognosy and geology.

8. The methods which have hitherto been employed to measure the heat developed by the combustion of simple, and also of compound bodies, do not appear to be sufficiently accurate. The Society therefore wishes, in consideration that the value of burning materials principally depends from this measurement, that these methods should be submitted to an accurate testing, and a new determination of that value by new means, and confirmed by repeated application, on a variety of the most usual burning materials.

9. Is Dalton's opinion, according to which the quantity of heat set free on the sudden oxidation of bodies is in accurate proportion to the oxygen which combines with them, well founded; or must it be admitted that Despretz has proved the incorrectness of that view? The Society requires that this interesting question be settled by accurate experiments.

The prize for the satisfactory answer to any one question consists in a golden medal of 150 florins value, and a gratification of 150 Dutch gulden. The answers may be written in Dutch, French, English, Italian, Latin, or German, and should be forwarded, free of postage, with the billets in the usual manner, to "J. G. S., van Breda, Perpetual Secretary of the Haarlem Society."

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## ANALYTICAL CHEMISTRY.

### *Separation of Glucinum from Iron, Cerium, Lanthanium, &c.*

SOME time since Dr. Schaffgotsch proposed separating glucina from the oxide of iron by extraction with caustic potash, but according to Dr. Scheerer this method is altogether objectionable when the precipitate contains iron, cerium, &c.; it is indeed so inaccurate, that, in an analysis of gadolinite for instance, only 3 per cent. of the oxide of glucinum could be obtained instead of 10 per cent., even when the precaution advised by Schaffgotsch, not to boil



the precipitate with caustic potash, but only to digest them in the cold, was attended to. If the oxides of yttrium, cerium, and lanthanum are first separated from the precipitate, then the separation of the glucina from the oxide of iron may be effected more perfectly by caustic potash, but the result is still unsatisfactory; for now about 6 per cent. glucina was obtained. The method of extracting glucina with caustic potash must therefore be abandoned altogether. Very satisfactory results are obtained by digesting the mixture of iron and glucina, after previous separation of the yttria and oxides of cerium and lanthanum, with a concentrated solution of carbonate of ammonia, and then immediately precipitating the dissolved peroxide of iron with sulphuret of ammonium.

#### *Separation of Yttria from Iron.*

This is well effected, according to Dr. Scheerer, by means of oxalate of potash. If the solution already contains potash in sufficient quantity, then oxalate of ammonia may be employed, for in this method it principally depends on there being no free acid present in the solution, which otherwise would dissolve a portion of the oxalate of yttria. To avoid this, the muriatic solution of the yttria and of the iron must be saturated with ammonia until its bright yellow colour is converted into a dark yellow; some solution of the acetate of ammonia (about 1.2 cubic inch) is then added, by which the liquid assumes a hyacinth red tint, when it is ready for precipitation with the oxalate of potash or ammonia. The first quantities that are added of either of these reagents do not effect a permanent precipitate, but merely change the red colour of the liquid to a yellow. Upon further addition a white precipitate is formed, which by stirring does not disappear. It is requisite to leave it for 24 hours in a moderately warm place, which allows of its being better filtered. This precipitate consists of a crystalline double salt of the oxalate of yttria and oxalate of potash, which is easily converted by incandescence into yttria and carbonate of potash. But the yttria cannot be accurately determined by adding water to this mixture, and then filtering; for the yttria exists in it in such a fine state of division that it passes through the filter. It is therefore requisite to dissolve the mixture in hydrochloric acid, to dilute this solution with much water, and to precipitate the yttria with caustic ammonia. The precipitate is then carefully washed with boiling water; however, it does not appear possible to remove every trace of potash in this manner. If the solution containing the yttria and iron was coloured *red* instead of yellow, on saturating with ammonia, the precipitate produced after the addition of acetate of ammonia by oxalate of potash contains more or less iron, which is evident by the colour. If the solution contained, besides yttria and iron, also cerium and lanthanum, these are precipitated with the yttria. Yttria, cerium and lanthanum may also be separated from the oxide of uranium by this method.



*Separation of the Protoxides of Cerium and Lanthanium from the Peroxide of Iron.*

The above method may also be followed in this instance, but in many cases it is more advantageous to employ the sulphate of potash for their separation. It must then however be remembered that the double salts of the protoxides of cerium and lanthanum with the sulphate of potash so obtained, are always more or less contaminated with the persulphate of iron, according to whether the solution was very concentrated or not. This impurification may amount to above 7 per cent. of the amount of the protoxides of cerium and lanthanum, and they should therefore be again dissolved, with the assistance of heat, in a large quantity of water to which some hydrochloric acid has been added, and precipitated with caustic potash. The precipitate is redissolved in hydrochloric acid and again treated with sulphate of potash, when the iron remains in solution.

*Proximate Separation of the Protoxide of Cerium from the Protoxide of Lanthanium.*

It is extremely difficult to obtain both entirely free from basic salts of cerium and lanthanum, and also from slight traces of alkali. If Mosander's method (extraction with nitric acid diluted with about 50 parts water) be employed, there is no certainty of larger or smaller quantities of cerium not being dissolved by those impurities. To obtain perfectly pure oxides, it is requisite to dissolve the oxides so obtained in hydrochloric acid, then to saturate the solution as accurately as possible with ammonia, upon which acetate of ammonia is added, and now thrown down with oxalate of ammonia. The precipitate, it is true, is very difficult to filter, even after having stood for 24 hours; it succeeds however at last on employing a double filter, and repeatedly returning the liquid which has passed through turbid. On heating the oxalate salts one may be certain of obtaining pure oxides for extraction with dilute nitric acid. They should be heated in a covered platinum crucible, but not too strongly, when they are left nearly white; protoxide of cerium and oxide of lanthanum are obtained.

[The above notices are extracted from a paper on Gadolinite, Allanite, and other allied minerals, published in Poggendorff's *Annalen*, 1842, No. 7.]

*Chloride of Palladium a Test for Iodine.*

Baumann has made some experiments on the comparative sensitiveness of an acid solution of the chloride of palladium and of the usual solution of nitrate of silver, and has found that one drop of the former produces a more voluminous precipitate than several drops of the latter in a solution of the iodide of potassium; and further, that when the solution is diluted 50,000 times, nitrate of silver still causes a white turbidness, and chloride of palladium, after a few minutes, black flakes; the dark colour of the precipitate with chlo-



ride of palladium renders it more easily perceptible. When diluted 500,000 times, neither of the solutions affords any reaction.—*Archiv der Pharm.*, xxix. p. 214.

*Separation of Zinc from Manganese, according to M. OTTO.*

The precipitate which is produced by the yellow prussiate of potash in solutions of the protosalts of manganese, is soluble in muriatic acid, the precipitate of zinc insoluble; if however the solutions contain chloride of ammonium, then the one is as insoluble as the other. When solutions of the chloride of zinc and protochloride of manganese, in which chloride of ammonium is present, are treated with ammonia, sulphuretted hydrogen immediately precipitates the zinc in the state of a white hydrated sulphuret of zinc, while sulphuret of manganese is only formed after some time, and when a large quantity of the reagent has been added; this latter precipitate is redissolved by acetic acid, which is not the case with the sulphuret of zinc.—*Ann. der Chem. und Pharm.*, xlii. p. 347.

*Determination of Sulphur in Iron.*

Dr. Bromeis observes that he has found an apparatus similar to that described by Will and Varrentrapp for nitrogen analyses, very useful in determining the small amount of sulphur in iron. The space however between the two bulbs should be in this instance replaced by 4 bulbs of equal size, in order that the sulphuretted hydrogen which is given off when the iron is dissolved in dilute sulphuric acid may be kept longer in contact with the ammoniacal solution of silver, as otherwise a portion of the sulphuretted hydrogen escapes unabsorbed along with the excess of hydrogen. The apparatus, when filled sufficiently, contains about 10 to 12 grammes of the solution of silver.—*Ann. der Chem. und Pharm.*, Sept. 1842.

## PHARMACOLOGY.

*On Cortex Monesiæ. By B. DEROSNE, O. HENRY, and J. F. PAYEN.*

THE true origin of this new drug is still unknown; the person who first sent samples of this bark from South America to Europe without any further notice, was induced to do so from the good effects she had observed from the use of the extracts in dysentery and other diseases of the intestines. The bark forms pieces of about 6–8 millimetres in thickness, is very close, heavy, hard, and of a dark brown colour; the epidermis is grayish, the surface of section chocolate brown, the fracture perfectly even, the taste at first sweetish, but subsequently acrid and irritating in the throat. It must be derived from some rather large tree, perhaps from a *Chrysophyllum* (*Sapotææ*). Guibourt has received samples of bark with the name *Buranhem* attached to them, which he considers to be *Monesia*.



Some travellers suppose the bark to owe its origin to *Rhizophora gymnorhiza*, Linn. (*Bugiera gymnorhiza*, Lam.), but this is most probably incorrect. It resembles the barks of *Acacia cochleocarpea*, Mart. (*Cort. Brasiliensis*, Pharm. Hamb.), and *Acacia virginalis* (*Cort. barbatimao s. Brasiliensis*, Pharm. Lisb.), but is certainly distinct. Nothing can be deduced from the name, for the bark decidedly does not belong to a *Monetia* or *Manetia* (*Rubiaceæ*).

The extract of *Monesia* forms blackish brown, very brittle tablets, from 20–25 millimetres in thickness. On the surface of fracture they do not in the least resemble Catechu and Kino. In water it is entirely soluble, and has at first a sweetish, subsequently astringent and irritating taste, resembling in many respects that of *Succ. liquiritiæ*. It occurs in commerce under the name of *Monesia*, in bottles, which are filled with the extract in solid fragments. Whether the extract is first prepared in Paris from the bark, or is imported direct from South America, is not known.

The chemical analysis of the bark afforded the following results:—100 parts of the dried bark contains, essential oil?, crystallized stearine, chlorophylle and wax, 1·2; glycyrrhizine, 1·4; monesine (an acrid extractive substance resembling saponine), 74·7; tannin, 7·5; red colouring matter (similar to kino red and catechu red), 9·2; traces of gum, malic acid, and malate of lime, 1·3; phosphate of lime and magnesia, sulphate of potash, chloride of potassium, malate of potash, oxide of iron, oxide of manganese, silica, 3·0; pectine, fibrine, and loss, 71·7.

On treating the pulverized bark in a displacement apparatus with water, a reddish brown infusion is obtained, of acid reaction and of sweetish, subsequently styptic bitter acrid taste; it is precipitated of a dirty yellow colour by tartar emetic, brownish gray by acetate of lead, flocculent and yellowish by solution of gelatine, blackish blue by sulphate of iron. On being gently evaporated, it left 24–25 per cent. of an extract resembling catechu and kino, soluble in alcohol and in water, with the exception of a little extractive matter.

Æther affords with the bark a greenish yellow extract, which on evaporation leaves a dark green mass behind. This is separated by water into an insoluble portion, consisting of chlorophylle, fat, and a crystalline saponifying stearine, which melts at 90° Fahr., and into a soluble portion, which contains a non-crystallizable substance which tastes like glycyrrhine, does not undergo fermentation, is thrown down by potash and sugar of lead, and affords with sulphuric acid a crystalline compound; it is therefore evidently glycyrrhizine.

Alcohol of 0·878 sp. gr. then affords in the warmth a clear extract, which, placed for several days in a closed vessel, deposits a grayish white powder (which proved to be malate of lime). The filtered solution is clear, reddish brown, has at first a styptic, then bitter and irritating taste and acid reaction. On evaporation it affords a dark brown, very dry extract, which may be reduced to a fine powder of a dirty brick-red colour and is soluble in cold water, with the exception of a few flakes of extractive matter. Gelatine and tartar emetic produce



a considerable precipitate in the filtered solution, but it is not wholly decolorized by them; sulphate of iron affords a blackish blue; lime, barytes, and sugar of lead, a gelatinous red; potash and ammonia, a gelatinous, brownish red precipitate; it is somewhat reddened by acids. Parchment extracted the tannin completely from the solution, but the liquid remained acid, brown and acrid. Lime or sugar of lead then threw down a red colouring substance, which resembled greatly kino red, and which, after its separation from the precipitate, was easily soluble in water and in weak spirits of wine, less so in strong alcohol. After the removal of these substances, the liquid contained free malic acid and monesia. If the bark be immediately extracted with weak alcohol, without first employing æther, the solution then also contains glycyrrhizine, which may be removed, after separating the red colouring substance, by treatment with æther containing a little sulphuric acid.

Monesine is best obtained by extracting the bark with hot alcohol of 0.906 sp. gr., adding to the tincture an excess of slaked pulverized lime, and shaking till it is rendered colourless; the magma, consisting of lime in combination with tannin, red colouring matter, malic acid, and glycyrrhizine, &c., is separated; the clear liquid distilled and dried, the residue again dissolved in water, treated with some animal charcoal, filtered and dried in the water-bath. An amorphous, slightly yellowish gummy, transparent residue is obtained, which may be reduced to a white powder easily soluble in water and in alcohol, but scarcely at all in æther. The aqueous solution froths very much. Monesine cannot be obtained in a crystallized state under any circumstances. It is void of smell, at first of a bitter taste, but soon becoming acrid and irritating in the windpipe. It does not saturate acids; it is converted by nitric acid into a yellow, easily pulverizable substance, which is scarcely soluble in water, but very easily in alcohol, is very bitter, and on evaporation of the solution affords crystalline laminæ. It behaves towards hydrochloric acid and potash like saponine, polygallic acid, æsculic acid, salsaparine, &c., and evidently belongs to the class of saponoid irritating extractive substances, the knowledge of which is still very imperfect.

Boiling water extracts from the bark already treated with alcohol and æther, traces of the above substances, gum and salts, but no starch.

It affords, on distillation with water, a product with scarcely any smell, which, on being shaken with æther, &c., leaves behind traces of an aromatic oil.

In its pharmaceutical employment the authors recommend the following forms:—1. The *Aqueous extract*, prepared by displacement. 2. The *Monesine*, prepared in the manner above described. 3. A *Syrupus monesiæ simplex*, 9800 parts syrup of white sugar, 100 dried extract of monesia, 100 water. 4. *Syrupus monesiæ compositus*: 1000 *Syr. monesiæ simpl.*, 30 *Aq. flor. naph.*, 1.6 *extr Capit. papav.* 5. *Tinctura monesiæ hydroalcoholica*, 500 *Extr monesiæ*, 7500 water, 2000 alcohol of 0.858 sp. gr. 6. *Monesia*



*pomade*, 4 oil of almonds, 2 white wax, 1 water, 1 extract of monesia. Monesine may be employed in the forms 3 to 6 if desired.

The dose of the extract, in the experiments made with it, has generally been from 8 to 12 decigrammes daily; in obstinate cases (metrorrhagia, profuse diarrhœa) daily 30 decigrammes; in gradually decreasing chronic cases, for instance in scrofula, up to 40 decigrammes may be administered daily. It has generally been found of use in atonic forms of disease, secretions of blood and serous excretions; inwardly, especially in cases of hæmoptysis, metrorrhagia, weakness of stomach, dysentery, diarrhœa, scurvy and scrofula. Less certain results have been obtained with respect to leucorrhœa, bronchitis (?), enteritis (?), &c. It has been employed externally against ulcers of various kinds, hæmorrhoids, congelations, ophthalmia, &c. Monesine has been administered inwardly in doses of 16 centigrammes. It has been found of essential service externally against atonic ulcers.—*Journ. de Pharm.*, 1841, Janv. p. 20.

## CHEMICAL PREPARATIONS.

### *On the Preparations of Opium. By M. LIMOUZIN.*

FEW substances have acquired, either from the long period they have been employed or from their useful properties, so just a celebrity as opium. Excessively praised by some and objected to by others, according as its effects agreed more or less with their views in regard to medicine, it was only towards the end of the last, and in the present century, that a more exact notion of its effects has been obtained. Various preparations and numerous processes have been recommended, but that which is known by the name of “aqueous extract of opium” seems to have fixed the attention of practitioners in all times as offering the best guarantee, inasmuch as it is the simplest mode of preparation, and contains moreover the principles of opium in their natural state. But although opium thus prepared is of greater service for medical purposes than in its natural state, as it is then always mixed with foreign ingredients, yet its composition may vary according to the amount of material acted on and the temperature employed in its preparation. Opium has been analysed by a great number of chemists, and has been found to contain—

Morphine.	A brown extractive acid.
Codeine.	Resin.
Narcotine.	Fat oil.
Narceine.	Bassorine.
Meconine.	Gum.
Meconic acid.	Caoutchouc.
Thebaine, or paramorphine.	Lignine.

Therapeutic experiments, made with each of the principles contained in opium, have shown that morphine and codeine are princi-



pally those which should be preserved in the extract of opium ; but, on the contrary, resin, fat oil and narcotine should be avoided, as they either do not act on the animal œconomy, or communicate injurious properties to the extract.

The best process, which was first known to attain this result, is that of Cornet ; it is the process which the French codex has adopted, and which is still generally followed. Subsequently M. Robiquet advised treating this extract with æther ; M. Limouzin-Lamothe had already proposed the use of pine resin.

Comparative chemical researches, made on each of the extracts prepared by these different processes, were therefore necessary in order to point out the advantage which that of M. Limouzin-Lamothe offers in medical practice.

#### *Extract of Opium of the Codex.*

50 grammes of extract of opium, prepared according to the Codex, but dried, were pulverized and treated with sulphuric æther for 48 hours ; at the end of this time the æther was decanted and evaporated ; it furnished a residue of crystallized narcotine and fat oil, of a brown colour, weighing 20 centigrammes.

Being persuaded that the sulphuric æther had taken up too small a portion of narcotine from the opium by reason of the imperfect contact which existed, I again dissolved the opium in distilled water, and added a fresh quantity of sulphuric æther equal to the first. After 48 hours of contact, facilitated by frequent agitation, the liquid was decanted into a previously weighed crucible ; the residue was in all respects similar to that obtained in the first operation, and weighed 1·10 gr. I again dissolved the opium, and after having raised the temperature to a suitable degree, I poured by degrees some ammonia into it until a precipitate was formed. The liquid being left to cool deposited a brown matter, which when washed and dried weighed 15·2 grs. This last precipitate was brought into a vial, into which 8 times its volume of æther was subsequently added. After 48 hours of contact, being agitated from time to time, it was decanted ; the solution, after evaporation, left a slightly coloured residue weighing 1 gr.

*Matter on which the sulphuric æther did not act, 15·2 grs. Substances dissolved by the sulphuric æther, 2·1 grs.*

#### *M. Robiquet's Extract of Opium.*

50 grammes of extract of opium of the Codex dried, the same which I had used in the preceding experiments, were dissolved in distilled water, and a sufficient quantity of sulphuric æther added to the solution ; and when, after having followed the directions given by the author of this process, the ætherized solutions no longer afforded a residue on evaporation, the aqueous solution was heated, and ammonia added, in order to determine the formation of the precipitate, which, being separated, after standing, washed and dried, weighed 15·25 grs. This precipitate, treated with æther as in the preceding experiment, furnished a solution, which, when eva-



porated in a capsule previously weighed, gave a residue which weighed 1 gr.

. *Matter on which sulphuric æther did not act, 14.25 grs. Substances dissolved by the æther, 1 gr.*

*M. Limouzin-Lamothe's Extract of Opium.*

This process consists in taking the extract of opium of the Codex, dissolving it in a sufficient quantity of rain water, so that the solution may be of the consistence of a syrup, and adding to it a quantity of pine resin equal to a quarter of the extract used. The resinous matter soon becomes soft; the mixture is then mixed with a spatula while boiling for about 10 minutes, and now left to cool, and the resin taken away. The extract of opium is afterwards concentrated to the requisite consistence.

50 grs. of this extract dried were dissolved in distilled water; to this solution some æther was added, which, after having remained in contact during 48 hours, and being now and then shaken, furnished a solution, which, decanted and evaporated, left a residue weighing 0.10 gr.

The aqueous solution, heated and treated with ammonia, furnished a grained precipitate, very little coloured, which, when washed and dried, weighed 13.4 grs. This precipitate, taken up by æther, with which it had remained in contact 48 hours, furnished a solution, which, on evaporation, only left some traces of residue.

*Matter upon which the sulphuric æther did not act, 13.4 grs. Matter dissolved, 0.10 gr.*

In comparing the results of the experiments just described, it will be evident, that if the quantity of narcotine and fat oil amounts to a mere trace in the extract of opium prepared with resin, there is also a decrease in the quantity of crude morphine obtained; but this difference is explained quite simply, for the morphine obtained in this latter case has very little colour, and is consequently exempt from the black fat matter which always accompanies it under other circumstances, and which is precipitated in flakes on the first addition of ammonia to aqueous solutions of opium. When compared to the extract of opium of the Codex, the colour is not so brown, the flavour is the same, its smell is much weaker, and by no means disagreeable. These considerations, joined to the modifications which it has undergone, allow of its use being extended in medical practice.—*Journ. de Pharm.*, Nov. 1841.

*Tinctura Rosæ Acida.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

GENTLEMEN,

Feeling convinced that you are always willing to give publicity to any communication likely to conduce to the progress of pharmacology in its connexion with chemistry, I take the liberty of forwarding to you the following description of a very simple method



of making an aqueous tincture of roses, from which may be prepared at pleasure the *Infus. Rosæ Comp.* of the London Pharmacopœia.

Take of *Rosæ Gall. pet.*  $1\frac{1}{2}$  oz. and *Sacchari albi* 2 oz.; pour upon them half a pint of boiling water, and macerate in a closed vessel at a gentle heat for 6 or 8 hours; then strain through linen with slight pressure, and treat the residue with a quarter of a pint of boiling water, macerate and strain as before; perform this latter process a second time, and collect the products, endeavouring to procure as nearly as possible 12 fluid oz. altogether (you cannot obtain much more without great pressure, as the petals swell up and retain the water with great tenacity); to these add, when cold, 4 oz. *Sp. Vini Rect.* and 1 oz. *Acid. sulph. dil.*

On the addition of the spirit the whole becomes much thicker and glutinous, dependent, I believe, on the separation of vegetable albuminous matter, which Liebig has shown to contain nitrogen. This circumstance, I think, would render it very prone to decomposition if kept long in the neighbourhood of the elements of water, and therefore I consider that one important part of the process consists in its entire removal from the tincture, for which purpose I recommend careful filtration through clean tow, or flannel made into a conical bag. In the course of a few days a second deposit may be formed, which must be removed in the same way; after this it will keep any length of time without further change. It is nearly 4 times the strength of the infusion ordered in the Pharmacopœia, so that 2 fluid drachms will equal an ounce of that preparation. It will be found that it rather improves in colour than otherwise by each filtration; but perhaps this may be attributed to the naturally gray colour of the albuminous matter imparting to it when present a whiter and lighter hue. All kinds of infusions, and more particularly the one now under consideration, being more or less liable to spontaneous decomposition, it has ever been a desideratum in pharmacy to obtain them in some concentrated form to obviate this great inconvenience; hence many preparations have been invented, and sold under the names of concentrated essences, infusions, &c.; but one objection is common to all of them, and that originates in the utter impossibility there is for the general practitioner or chemist who may make use of them to be able to depend upon their genuineness, since it is very certain that they frequently contain many other ingredients than the correct one, and at any rate it must be acknowledged that they present numerous opportunities for fraudulent imposition. The plan however above proposed is so exceedingly simple, that any one may adopt it without difficulty; and as a proof of its success I herewith send you a small quantity of some which has been made more than two months, but at present does not exhibit the slightest change indicative of incipient decomposition. The best test for ascertaining if all the albuminous matter has separated is by mixing together equal parts of the tincture and rectified spirit, when, if after a few hours no coagulation is discern-



ible, you may conclude that it has been entirely removed, and that no further decomposition will take place\*.

Faversham, Kent, Jan. 17, 1843.

E. L.

### *The Golden Sulphuret of Antimony.*

The golden sulphuret of antimony, prepared according to the greater part of the formulæ which have been published, is never constant in its composition. Since the discovery of the salt of Schlippe (sulpho-antimoniate of sodium), most of the German Pharmacopœias have prescribed the preparation of the golden sulphuret, by pouring a weak acid into the solution of the salt of Schlippe, as it is then of a constant composition and free from arsenic, the sulphuret of arsenic and of sodium remaining in the mother-ley. M. Frederking has compared several of the formulæ to determine their respective values as to the goodness and the amount of the product.

*Hamburg Pharmacopœia.*—Make caustic 6 parts of carbonate of soda by means of  $1\frac{2}{3}$  part of quick lime and 32 parts of water; dissolve in the filtered liquid 3 parts of sulphuret of antimony and 1 part of flowers of sulphur, filter, and leave the salt of Schlippe to crystallize. This formula gives a small excess of soda.

2. *Mitscherlich.*—Boil a mixture of 10 parts of crystallized carbonate of soda, 11 parts of sulphur of antimony, 5 parts of lime, and 1 part of flowers of sulphur. In this case the amount of sulphur is too little.

3. *Russian Pharmacopœia.*—Boil in a sufficient quantity of caustic soda 2 parts of sulphuret of antimony and 2 parts of flowers of sulphur. Here there is too much sulphur, and moreover as the combination does not crystallize, sulphuret of arsenic is precipitated at the same time with the yellow sulphuret.

4. *Prussian Pharmacopœia.*—Fuse 6 parts of dried carbonate of soda, 6 parts of prepared sulphuret of antimony, and  $3\frac{1}{2}$  parts of flowers of sulphur with charcoal. Duflos has already observed that this formula prescribes too much soda and too little sulphur; besides, the soda is very imperfectly converted into the sulphuret by calcination with sulphur and the charcoal.

5. *Schlippe.*—Fuse 8 parts of the dried sulphate of soda, 4 parts of sulphuret of antimony, and 2 parts of charcoal; add 1 part of sulphur in a boiling state to the mass dissolved in water. The proportion of sulphuret of antimony is too little.

The processes 1, 2 and 5 alone gave a satisfactory result; but M. Frederking obtained a very beautiful and very abundant produce by using the proportions prescribed by the Pharmacopœia of Strasburg and following the method of M. Mitscherlich. 9 parts of crystallized carbonate of soda were dissolved in 40 parts of

\* There is also a great saving pecuniarily, for I find 5s. 4d. is about the usual price per pint for concentrated essences; whereas two pints of a tincture of this sort, supposing it to be only half their strength, may easily be made for 3s. 9d.



water; while the liquid was boiling, 4 parts of prepared sulphuret of antimony,  $1\frac{1}{2}$  part sulphur, and 10 milk of lime, prepared with  $2\frac{1}{2}$  parts lime and 7 water, were added. After  $2\frac{1}{2}$  hours boiling the liquid was filtered, then concentrated to hasten crystallization.

The residue remaining on the filter was boiled for  $1\frac{1}{2}$  hour with the mother-ley decanted from the crystals and 20 parts of water. It was again filtered, and the residueedulcorated and the liquids again evaporated. The mother-ley was now abandoned; it afforded with acids a precipitate which contained arsenic. M. Frederking obtained from this operation  $7\frac{1}{2}$  parts of salt of Schlippe, which gave more than half their weight of a very beautiful and pure golden sulphuret.—*Journ. de Pharm.*

### *Purification of Cream of Tartar.*

In order to free cream of tartar from lime and from copper, M. Duflos places 24 pounds of crystals of white tartar in a perforated porcelain crucible, which is suspended in a vessel containing a mixture of 2 lbs. of muriatic acid with 12 lbs. of water, so that the crystals of tartar are just covered by the dilute muriatic acid. The whole is left in contact at a gentle heat for 24 hours; the crystals are then removed, drained, washed and dried. M. Soubeiran has repeated this process, and finds it to succeed very well.—*Journ. de Pharm.*

### *Salicine.*

This substance has also been obtained by M. Riegel from the bark of the young branches and from the leaves of *Salix fragilis*, Linn., and likewise from the young bark of *Salix caprea*, Linn.; from 16 oz. bark, 165 grs. of salicine.—*Jahrb. für Prakt. Pharm.*, 1842, p. 35.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *The Manufacture of Vinegar by the New or Quick Method.*

If the conditions which we enumerated in our last Number as being requisite for the formation of vinegar from alcoholic liquids be borne in mind, viz. that it is requisite for each particle of the alcohol contained in them to come in contact with the atmospheric air, it is very evident that a considerable time must elapse before this can take place in a cask, the liquid in which presents to the atmosphere a proportionally small surface. It is moreover palpable that the preserving of the acetous mixture at a high temperature (between  $86^{\circ}$ — $100^{\circ}$  Fahr.), and the heating of the vinegar room during so long a time, can only be done at a considerable expense, from the great amount of fuel required. These two desiderata are exhibited by the old method in a high degree, and great attention



has been directed to the discovery of a new process of manufacture in which these deficiencies should not occur. This has now been attained to such an extent by the quick method, that it is scarcely possible to conceive of any further improvement in the manufacture of vinegar; for the highest aim of the manufacturer, the conversion of alcohol into acetic acid without loss, and in the least possible time, has been as completely accomplished as can be expected in chemical processes carried out on a large scale.

Although the present process of manufacture may be termed new, yet a quite similar one was followed by Boerhaave long before a true notion of the formation of vinegar had been obtained; and it may be said that the new process has originated from that of Boerhaave since our knowledge of the correct theory. It will be seen how closely both are related; it will, in fact, be evident that the process of Boerhaave for the manufacture of vinegar, somewhat improved, is that which may now be recommended as the most advantageous.

Boerhaave employed in preparing vinegar two spacious casks of the same size, one of the ends of which was knocked out, and the bung-hole closed, and placed them upright on the frame of the vinegar room. These vessels were then filled with the stalks and husks of grapes, the one filled entirely with the vinegar mixture, the other only half. After from 12 to 14 hours, half the liquid was drawn off from the full cask, and poured into the one half-full. This operation was repeated every 12 to 24 hours, so that alternately the one vessel was full, the other only half-full.

The formation of vinegar proceeded now most rapidly in the vessel only half-full, which was evident from the suffocating vapours which were evolved from it, and moreover from the temperature in it far exceeding that of the vinegar room, while in the full vessel it was scarcely any, or not at all higher.

Instead of changing the fluid every 12 or 24 hours, as in the commencement, it was subsequently done more frequently, about every 3 to 4 hours, until in the course of 14 days such a vinegar was obtained as in the ordinary process would have needed months.

When we had become acquainted with the true manner in which vinegar is formed from alcoholic liquids, the great efficiency of Boerhaave's process could be easily understood; it was evident that in the half-filled cask the formation of vinegar must proceed more rapidly and efficaciously, from the grape husks contained in it, and to which the acidifying liquid adhered, presenting to the atmosphere a much larger superficies than a cask containing no grape husks, but entirely filled with liquid. The surface which a liquid in an upright and filled vessel offers to the atmosphere must in every case be small; even when the vessel is only half-filled and the sides of the empty portion moistened with it, the superficies is only proportionately increased in a small degree; but when the free space of the vessel above the liquid is filled with grape husks, or any similar body, which leaves a number of intervening spaces, the surface is increased to a very considerable extent, and the more so the



smaller the spaces are which the grape husks leave. If now the grape husks are moistened by the acidifying liquid, this is presented to the action of the atmosphere on a considerably enlarged surface; and as we know that each particle of the alcohol to be converted into vinegar must be brought into contact with the atmosphere, it is clear why in Boerhaave's process it was effected far more rapidly than by the old method.

In this manner, then, the first condition for the quick manufacture of vinegar is gained in an advantageous manner. The second condition, viz. a temperature of between  $86^{\circ}$ — $100^{\circ}$ , which in the old method was a source of considerable expense on account of fuel, is accomplished by this new method itself, for from the rapid formation of the vinegar far more heat is set free in the same time,—which effects the heating of the liquid to be rendered acid.

In the conversion, for instance, of 10 lbs. of alcohol into vinegar, the same quantity of heat is set free whether the change is effected slowly or rapidly; but in the first case the heat is distributed over a longer period of time; say, for instance, in the old method of manufacture 50 days and  $500^{\circ}$  of heat were set free, this will amount for each day to  $10^{\circ}$ , which is easily carried off by the surrounding atmosphere, and can assist little in raising the temperature of the liquid. Let us now take the quick method, and say 10 days, then the heat set free for each day equals  $50^{\circ}$ ; if only 1 day is requisite for the conversion we have  $500^{\circ}$ , or for each hour more than  $40^{\circ}$ ; and these evidently cannot be carried away so soon, but will keep the vinegar mixture in the vessels at a pretty high temperature.

The great efficacy of Boerhaave's vessels will be evident from what has been above stated; however, the change of air in them was still slow, and when of late attention was drawn to this subject, the first object was to increase this. The casks were perforated that the air might enter, so that from the escape of the heated and deoxygenated air from the upper part of the vessels a constant change of atmosphere is effected, as in a furnace. This is the most essential improvement on Boerhaave's plan.

The acidifying casks used in this process are generally from 5 to 7 feet high, and  $2\frac{1}{2}$  to 3 feet in diameter, somewhat narrower at the bottom than at the top, and constructed of oak. At about a foot from the bottom, and just above the cock by which the acidified liquid is drawn off, the tub is perforated by 6 holes, about an inch wide and sloping downwards, through which the air may enter, but none of the liquid flow out. The vessel is closed by a cover, in the centre of which a hole has been made 2 to 3 square inches wide. These vessels are now filled with curled beech shavings, which must neither be too thin nor too thick, otherwise they possess too little elasticity, and in the latter case do not curl. Previous to use both the tubs and shavings should be repeatedly scalded with hot water to extract the soluble substances, and when dried imbued with hot vinegar. These vessels are arranged on wooden frame-work, or on a pier of brick-work, sufficiently high to allow of the liquid being conveniently drawn off.



The manufacture of vinegar is now carried on in the following manner:—The vinegar mixture should contain two-thirds less alcohol than prescribed, and also less vinegar. For instance, suppose the vessels holding the mixture to contain 180 quarts, the mixture should consist of 20 quarts alcohol, 40 vinegar, and 120 quarts water; but instead of this a mixture is formed of 20 quarts vinegar,  $15\frac{1}{2}$  alcohol, and 137 water. The  $7\frac{1}{2}$  quarts alcohol that are wanting are subsequently added. It is requisite that the water should be heated to  $100^{\circ}$ — $104^{\circ}$ , that the mixture may have a temperature of  $86^{\circ}$ — $90^{\circ}$ .

According to the size of the acidifying vessels, from  $2\frac{1}{2}$  to 5 quarts of this mixture are poured on to the shavings every half hour, the vessels immediately covered with their lids, but the aperture left open. When all the prepared mixture has filtered through, the liquid contents are drawn off into the vessels in which the mixture was prepared, and 5 quarts of alcohol added. The liquid is now passed through the shavings a second time, and drawn off, the remaining  $2\frac{1}{2}$  quarts alcohol added, and again let percolate a third time.

The liquid which has passed through the shavings once forms a weak, the second time a strong, and the third time a perfectly good and very strong vinegar. The reason why the whole amount of alcohol is not added at once is, that even in a favourable course of the process a portion of the alcohol escapes conversion into acid, on which account first 5, and then  $2\frac{1}{2}$  quarts are subsequently added.

It will be seen how very simple the whole process is, and by calling to mind what has been above stated, the rapid formation of vinegar will be perfectly intelligible. What is the cause of the rapid formation of vinegar? It is the considerable increase of surface of the fluid to be rendered acid, that is, exposed to the action of the atmosphere, and the high temperature within the vessels. When the vinegar mixture has been brought into the acidifying vessels, it diffuses itself over the shavings, and the surface of the mixture becomes equal to that of the shavings, therefore certainly several hundred times greater than in the old method. The air which passes through the lower apertures of the cask gives off its oxygen to the alcoholic mixture, converts it into vinegar, and so escapes partially deprived of its oxygen through the aperture in the lid, because its specific weight has been rendered less by the heat of the vessel, and fresh air constantly passes in through the lower draught holes. The rapid oxidation of the alcohol naturally liberates much heat, which contributes considerably to keep the mixture at a proper temperature. If the room has a temperature of  $77^{\circ}$  Fahr., and the mixture about  $82^{\circ}$ , the temperature in the interior of the vessel will amount to between  $95^{\circ}$  and  $100^{\circ}$ ; and it is essentially necessary that the interior of the acidifying vessels should not be less than  $95^{\circ}$ , otherwise it is a sign that the vinegar mixture is as it were in a diseased state; it breathes too little oxygen, and consequently scarcely any formation of vinegar takes place. To prevent, as much as possible, heat being carried off by the surrounding atmosphere,



the vessels, with the exception of the 6 apertures in the cask and that in the cover, are covered with bad conductors of heat, such as linen or paper.

Some manufacturers advise the keeping of the room at a temperature of  $100^{\circ}$ , or even  $111^{\circ}$  Fahr., but this can only be accomplished in a room in which, on account of the great consumption of oxygen, a strong current of air must exist, at a considerable expense of fuel. The object said to be attained by this high temperature is, that the air which passes in at the apertures does not, on account of its high temperature, deprive the vessels of any heat. But far from this being of use, it is absolutely disadvantageous, for the temperature in the vessel becomes too high, which creates too strong a draught, and the air carries away with it out of the vessels a quantity of alcohol and acetic acid; and moreover the acetic acid formed is more liable to be converted into carbonic acid and into a slimy substance, in a word, only a weak vinegar is obtained. In this new process for manufacturing vinegar, as in many other things, extremes should be avoided; there should not be too high a temperature, as this occasions a loss of acetic acid and of fuel; nor one too low, as this gives rise to an unnecessary loss of time and labour.

In the above exposition of the manufacture of vinegar by the quick process, we have hitherto spoken only of the preparation of an artificial wine vinegar or alcohol vinegar, but this process may be employed in making all the other kinds. When fruit or malt vinegar is prepared in the above manner, the liquid must be as clear as possible before it is brought on to the shavings, otherwise these soon become clothed with a slimy substance, which must be removed. When this has occurred, they are taken out, placed in a vessel, and cleansed with a broom and hot water, after which they are dried, and again brought into the acidifying vessels, and imbued with acid.

In conclusion, we may observe that it has sometimes happened that the manufacturer has found all his alcohol gone, and scarcely a trace of vinegar formed—a somewhat perplexing situation for one not acquainted with the freaks of chemistry. But the cause of this is easily found; the supply of air had been insufficient to allow of the alcohol undergoing perfect metamorphosis, and only aldehyde was able to form. This body is extremely volatile (it boils at  $72^{\circ}$ ), and consequently soon disappears, and the manufacturer finds, to his surprise, his wine converted into water. One of the essential conditions in this process is, that the supply of fresh air should not be limited.

This article has been drawn up from various sources, but principally from H. Rose's 'Lectures on Organic Chemistry,' and Otto's valuable *Lehrb. der rationelle Praxis*.—W. F.



## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

*Jan. 3, 1843.*—(Prof. Thomas Graham, President, in the Chair.) The following communications were read:—"On Palladium, its Extraction and Alloys," by W. J. Cock. After cursorily detailing the history and sources of this metal, the author proceeds to the means adapted for its extraction from the gold ores of the Brazils as practised in their establishment. The gold dust, as it arrives in this country, is first fused with silver and granulated; it is then subjected to the process of parting by nitric acid, which dissolves all the alloyed metals and leaves the gold pure. From the solution in nitric acid the silver is next separated by precipitation with chloride of sodium as chloride of silver, and then the palladium and other metals are thrown down together, in the form of a black metallic powder, by zinc. This powder is next to be redissolved in nitric acid, and solution of ammonia added in excess, which precipitates all the metals as oxides, and then redissolves those of palladium and copper. To the ammoniacal solution muriatic acid is added in excess, which occasions the formation of a copious yellow crystalline powder, the double chloride of palladium and ammonia, while the oxide of copper remains in solution. By subsequently submitting this double salt of palladium to a red heat, the pure metal is obtained in a porous state. The characters and properties of this metal, together with the curious oxidizing action of the atmosphere upon it at a dull red heat, producing the brilliant colours so usually accompanying this metal, particularly in its porous state, are then detailed. The alloys of palladium with gold, silver and copper, and their properties and applications to various purposes in the arts, are in conclusion fully explained and illustrated by numerous specimens.

"On the Formation of Fat in the Animal Body," by Dr. Justus Liebig. The observation that the carnivorous races of animals thrive perfectly well on food destitute of such non-azotized bodies as sugar, starch and gum, leads to the conclusion that these substances are not employed in the vegetable feeders in the proper nourishment of their bodies, that is, in the formation of blood, but for another purpose, namely, the generation of animal heat by combustion, at the expense of the oxygen of the air. The disappearance in like manner of fat in the animal system, in circumstances where rapid oxidation is known to occur, seems to point out a similarity in the use of the latter, which thus becomes burned in the body to carbonic acid and water, in the absence of the vegetable principles above mentioned. It is well known that graminivorous animals, abundantly supplied with food containing starch or saccharine matter, and whose respiration is to a certain extent checked by want of motion and exercise, become in a short time loaded with fat, which the above consideration indicates to have been formed out of the excess of non-azotized food over and above that required for respiration. This is supposed to take place by a metamorphosis analogous to that by which alcohol and carbonic acid are produced from sugar. This opinion of the origin of fat has recently been called in question by



M. Dumas, who contends that the whole fat of an animal body has been furnished ready formed, in that state, by the food itself, and cites an experiment in which a goose had been fed for some time upon maize supposed to be free from fatty matter, the starch of the grain appearing to have generated the fat found in the bird, an inference which he rejects by showing that maize itself contains a large quantity of oil: it therefore became desirable to obtain additional evidence on the subject. In an experiment at Giessen, 3 young pigs were fed during 13 weeks on peas and potatoes, the quantity of fat contained in those vegetables being calculated from the researches of Braconnot and Fresenius. It was found, at the expiration of that time, that the bodies of these animals contained no less than about 70 lbs. more fat than could possibly have been given in the food, and which was therefore inferred to arise from an alteration of the starch. An equally satisfactory experiment is described by Bous-singault, in which the butter furnished by a cow was found to exceed greatly the fat of the food. The author then proceeds to state the result of a chemical examination of hay and straw with reference to fatty matter, and describes them to contain about 1.5 per cent. of a crystalline waxy matter mixed with chlorophyle, altogether different from ordinary fat. The excrements of a cow fed on those substances yielded a quantity of the same waxy substance, corresponding very closely to the whole quantity contained in the food, so that it appears quite evident that the fat of the butter does not arise from this source. The paper concludes with some curious observations on the very variable quantity of oil found in maize grown in different localities.

*Meeting of the Royal Institution.*

Friday, Jan. 20, 1843.

These highly interesting meetings commenced on the above evening with all the spirit and energy heretofore displayed, and reflect much credit on the gentlemen of the committee of management of this institution, who are entrusted with the arrangement of these Friday evening associations. The library contained many very interesting specimens of works of art, and the productions of science, and several curiosities from private collections. Among the chemical preparations we noticed two elegant products, caffeine and theine, which by an oversight had not been entered on the usual lists of objects placed on the library table. Dr. Carpenter exhibited, by means of the microscope, several of the beautiful illustrations of sections of shell which form parts of the valuable paper lately read before the Royal Society.

We must now turn to the more important matter of the evening, the lecture on Elective Induction; and when we state that this was by Dr. Faraday, our readers will hardly need more to induce the conviction that it was an excellent one, and delivered with that facility and tact which so preeminently distinguish that talented individual. The experiments were elegant and conclusive, and there were two in particular which require especial mention. The one was the proof that the electricity was induced from an interior metal jar, to the inside of which the electric fluid had been con-



veyed by a metal carrier ball, insulated by a silk string, through a series of 4 jars, each insulated by a cake of shell-lac from the next in succession to the outside of the exterior one. This was proved by a very small electrometer, each of the metal jars being supplied with a silk string, by which it could be easily lifted out without touching the next jar. The other experiment, the Professor stated was one which he had not yet tried himself, and, although sure in principle, might from some unforeseen accident fail in practice. It consisted of a jar of wire gauze, with rather large meshes, and having been placed on an insulated stool, was charged on its interior as before; this again proved, in the most beautiful manner, that the whole of the electricity had accumulated on the exterior. On these principles it was argued that whatever might be the size or shape of a body, the earth or a cloud for instance, the whole of the electricity would be accumulated by induction to its exterior, and that although the electric fluid might be existent in abundance, particularly on the surface of the earth, the inhabitants would be perfectly unacquainted with their situation, unless some discharge should take place in close approximation to their position at that time. Some well-contrived experiments were exhibited as proofs of this opinion.

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## PATENTS.

*Patent granted to William Henry Fox Talbot, Esq., of Lacock Abbey, for Improvements in Coating or Covering Metals with other Metals, and in Colouring Metallic Surfaces.*

THE first part of the invention consists of adding gallic acid to the metallic solution intended to be precipitated. Any convenient solution of silver, gold or platina is taken, and to each of them added a solution of gallic acid in water, æther or alcohol, which latter is preferable. Into any one of these mixtures is then immersed a clean bright plate of metal until it becomes coated (as the case may be) with silver, gold, or platina. It is best to begin with a weak or dilute solution, and afterwards to use a stronger one. The gallic acid need not be pure, but cheaper liquids, containing a considerable portion of it, or of an analogous vegetable substance, may be used instead of the pure acid. The next part of the invention is a method of silvering metallic surfaces. For this purpose freshly precipitated chloride of silver is dissolved in hyposulphate of soda, or any other liquid hyposulphate. Into this solution is then immersed a clean bright plate of metal, which is very rapidly coated with a bright silver coating. In order to obtain thicker coats of metal a galvanic battery is employed in the way now well known, using one of the liquids described in the first and second parts of this specification, and employing for one of the poles or electrodes a piece of metal of the same kind as that which is intended to be precipitated. The metals which may be coated with other metals by the processes above described, are brass, copper, German silver, and also (though less effectually) iron and steel.

The next part of the invention is a method of ornamenting sur-



faces of brass or copper, by first gilding them partially according to some pattern, and then washing them over with a solution of chloride of platina, which has no action on the gilt parts, but gives a dead black appearance to the rest of the surface, thus enhancing the brilliancy of the parts which are gilt.

The last part of the invention is a method of colouring polished surfaces of copper, by exposing them to the vapour of sulphuretted hydrogen, or of any of the liquid hydrosulphurets, or to the vapours of sulphur, iodine, bromine or chlorine, or by dipping the metal into liquids containing them; but the hydrosulphurets are preferable. By this means very brilliant colours are obtained on the copper, and by partially protecting the surface of the metal according to any determinate or ornamental pattern, very pleasing effects are produced, exhibiting great contrast of colours in a little space. As it is easy to render the copper nearly white by the method above described, it may be employed for obtaining metallic specula or mirrors as follows. An electrotpe cast is taken in copper from a polished plane or spherical metallic surface, which cast has nearly the same degree of polish as the original, and it is then exposed to the action of vapours as above described, until it is sufficiently whitened, which is effected without injuring the polish. As the surface of the speculum thus obtained is already combined chemically with sulphur or one of the other bases or substances above mentioned, it is consequently less liable to tarnish or oxydate subsequently by any exposure to the atmosphere.—Sealed Dec. 9, 1841.

*Patent granted to Charles Bunt, of Pary's Mine, Anglesea, for an improved Method of obtaining Paints or Pigments by the Combination of Mineral Solutions and other Substances.*

This invention consists in the addition to any waters holding in solution either the oxide of iron, or sulphate of iron, copper or zinc, or any two or more of those substances, of a mixture of quicklime and water, or a solution of any other calcareous substance. By this operation a yellowish-coloured precipitate is obtained, which may be either used as a paint in its original state, or may be converted by calcination into a paint of any of the different colours or shades of colour capable of being produced by that process.

The waters which most avail for the purposes of this invention, are those which flow from copper, tin and coal-mines, or have drained from the waste or refuse heaps of such mines, after exposure to the atmosphere and rain, and those which have been used for washing or cleaning copper and tin ores. The solution of lime is about the consistency of white-wash, and the quantity used is about one-fourth that of the waters operated upon.

*Claim.*—The method of obtaining a yellowish-coloured paint or pigment, convertible by calcination into paints or pigments of other colours or shades of colour, by the combination of any mineral water, holding in solution either sulphate or oxide of iron, or sulphate of copper or zinc, or any two or more of those substances, with a mixture of quicklime and water, or any other calcareous substance.—Sealed Sept. 16; 1842.



# THE CHEMICAL GAZETTE.

No. VIII.—Feb. 15, 1843.

## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On Coumarine, or the Stearoptene of the Tonka Beans.*

By M. DELALANDE.

THIS principle occurs perfectly pure in small crystals in the Tonka bean, and also in small quantity in the flower of *Melilotus officinalis*. To extract it, it suffices to cut the beans into small slices, and to wash them with cold alcohol of 0·848, which is then evaporated to the consistence of a syrup: on cooling the coumarine crystallizes in small yellowish prisms, which may be purified by recrystallization. Thus obtained, it is perfectly white, melts at 122° Fahr., and boils at 518° without any perceptible alteration; it possesses a very agreeable aromatic odour, and a hot taste similar to that of essential oils. Its vapour has a very energetic action on the brain. The crystals are hard, scarcely soluble in cold, but in great quantity in boiling water, from which it crystallizes on cooling in minute white needles.

The composition of this substance was found to be—

	I.	II.	Atoms.		Theory.
Carbon . . . . .	73·9	74·0	= 36 =	1377·3	73·8
Hydrogen . . . .	4·6	4·8	= 14 =	87·3	4·6
Oxygen . . . . .	21·5	21·2	= 4 =	400·0	21·6
	<u>100·0</u>	<u>100·0</u>		<u>1864·7</u>	<u>100·0</u>

This composition seems to connect it with the cinnamyle series, discovered by Dumas and Pelago. We should have—

$C^{36} H^{14} O^2$  cinnamyle.

$C^{36} H^{14} O^3$  anhydrous cinnamic acid.

$C^{36} H^{14} O^4$  coumarine.

$C^{36} H^{14} O^5$  anhydrous coumaric acid.

It seems moreover to be intimately related to the benzoyle series of Liebig, and also to that of salicyle of Piria. When brought into contact with a solution of potash at a gentle heat, the coumarine dissolves rapidly, colours the liquid yellow, loses its odour, and appears to form a true combination, from which it is precipitated unchanged by acids. In presence of a concentrated boiling solution of potash it decomposes the water, combines with one equivalent of oxygen, and sets hydrogen free, forming coumaric acid; to obtain



which in a free state the residue is dissolved in water and the alkali saturated with an acid. It is then thrown down in transparent, very bright lamellæ, easily distinguished from coumarine, from that substance crystallizing under the same circumstances in long white silky needles. It is soluble in boiling water, from which it crystallizes on cooling; it is not volatile without decomposition, and when submitted to the action of heat decomposes into a volatile oil and a resin. The acid has a bitter taste; it reddens litmus and saturates bases; its vapour smells very much like that of benzoic acid.

On analysis it was found to consist of—

	I.	II.	Atoms.		Theory.
Carbon . . . . .	66.2	66.4	= 36 =	1377.3	66.3
Hydrogen . . . .	5.0	4.8	= 16 =	99.8	4.8
Oxygen . . . . .	28.8	28.8	= 6 =	600.0	28.9
				<hr/> 2077.2	

which lead to the formula  $C^{36} H^{14} O^5 + H^2 O$ .

When coumarine is conveyed into fused potash, pure hydrogen is first disengaged, and the coumarine oxidized; but if the action is continued, vapours of an aromatic odour are given off, which burn with a coloured flame. The coumaric acid which had formed loses 8 atoms of carbon and 4 atoms of hydrogen, and is converted into salicylic acid.

When coumarine is conveyed by degrees into cold fuming nitric acid, it dissolves immediately without disengaging any gas, or causing any elevation of temperature. On the addition of much water a substance is deposited in white flakes, which is nitrocoumarine; that is, coumarine which has lost  $H^2$  and taken in its stead 1 equivalent of  $N^2 O^4$ , in accordance with the theory of substitutions. This product appears to be volatile, is soluble in boiling alcohol, from which it crystallizes in minute white and silky needles. It was found to be composed of—

	I.	II.	Atoms.		Theory.
Carbon . . . .	56.5	56.7	= 36 =	1377.36	56.7
Hydrogen . .	2.9	3.15	= 12 =	74.88	3.0
Oxygen . . .			8 =	800.00	33.0
Nitrogen ..		7.64	= 2 =	177.04	7.3
				<hr/> 2429.28	

The reaction is easily explained; water and nitrocoumarine are formed,

$$C^{36} H^{14} O^4 + N^2 O^5 = \begin{cases} H^2 O + C^{36} H^{12} O^4 \\ N^2 O^4 \end{cases}$$

When brought into contact with potash in the cold it gives it an orange red colour, and seems to form a compound with it; acids precipitate it unchanged, but if the temperature be raised the nitrocoumarine is considerably altered; ammonia is liberated, the colour becomes darker, and at last assumes the tint of prussian blue; and when the residue is dissolved in water and saturated by an acid, a red powder, of the appearance of kermes, is deposited.

Nitric acid of commerce converts coumarine into carbazotic acid;



concentrated hydrochloric acid has no action on it, which is also the case with ammonia, whether dry or in solution. None of the metallic salts have any action on it; chlorine and bromine afford with it white crystallized compounds; alcoholic solution of iodine converts it into a crystalline substance of a bronzed green with a golden lustre.

When coumarine is heated with a solution of perchloride of antimony in hydrochloric acid, a considerable amount of gas is liberated, and on cooling a quantity of yellow crystals called chloro-antimoniuret of coumarine are deposited. It appears to be decomposed by water, and on analysis was found to consist of—

	I.	II.	Atoms.		Calculated.
Carbon . . . . .	33·6	35·5	= 36 =	1377·3	34·4
Hydrogen . . . .	2·8	2·5	= 14 =	87·3	2·2
Oxygen . . . . .			4 =	400·0	
Chlorine . . . .	34·0		6 =	1326·0	33·1
Antimony . . . .	22·4		1 =	806·4	20·2
				<hr/> 3997·0	

From the composition of coumarine, and the action of potash upon it, it would appear to belong to the class of the hypothetic radicals benzoyle, cinnamyle and salicyle; if this should be proved by further experiment, it would be the first example of a free radical of this kind, and nitrocoumarine that of a radical modified by substitution.

The transformation of coumaric acid into salicylic acid establishes a relation not only between these two bodies, but even between the two series to which they belong: thus,

Cinnamyle . . . . .  $C^{36} H^{14} O^2 - C^8 H^4 = C^{28} H^{10} O^2$  benzoyle.

Cinnamic acid ..  $C^{36} H^{14} O^3 - C^8 H^4 = C^{28} H^{10} O^3$  benzoic acid.

Coumarine . . . . .  $C^{36} H^{14} O^4 - C^8 H^4 = C^{28} H^{10} O^4$  salicyle.

Coumaric acid ..  $C^{36} H^{14} O^5 - C^8 H^4 = C^{28} H^{10} O^5$  salicylic acid.

So that the series of benzoyle might be considered as derived from the series of cinnamyle, benzoyle and salicyle being corresponding radicals to cinnamyle and coumarine,—radicals capable of losing a part of their elements in order to change into other radicals of more stable nature.

The transformation of coumarine into carbazotic acid also points to the relation between it and salicyle.

In a note appended to this memoir by M. de la Provostaye, on the crystalline form of coumarine, it would appear to belong to the rhombic (right rectangular prismatic) system.—*Ann. de Chim. et de Phys.*, Nov. 1842.

### *Sheep treated by Arsenious Acid in large Doses.*

The following circumstances were mentioned by M. Gasparin at a meeting of the French Academy of Sciences, Jan. 2, 1843. During 1842, M. Cambessido, who is well known to the Academy by his botanical works, had a numerous flock of sheep, which were attacked



with chronic pleurisy from the sudden and great transitions of temperature during the season. Many of them had already died, and others appeared to be fast sinking, when he learned, to his surprise, that a hatter had been most successful in curing such cases by administering large doses of arsenious acid. He resolved to try it on 20 of his sheep that seemed the most unwell. To each of these accordingly he gave an ounce of arsenic mixed with salt; and with the exception of 2 which died 8 days after the powder was given, they all completely recovered. His success was so great, that he determined to try it on 100 other sheep, the rest of the flock that were suffering, and its administration was attended with the same good result. There were only 7 deaths in all among those to whom the arsenic was given. This substance also has no bad effect when administered to sheep in a state of health, consequently it is not poison to them; and it is said to be equally innocuous to cattle. M. Gasparin observes that he felt the danger of publishing statements like these; but they were too well known to be hid, and would likely soon appear in print; but as they were new to him, he thought it his duty to mention them to the Academy, in order that, if true, they might be confirmed by other experiments. The paper was sent to the Commission on arsenic, to which MM. Magendie and Gasparin were added.

On the 9th, the Commission on arsenic, which at the last meeting was ordered to perform experiments, to ascertain whether the facts were true as related by M. Gasparin about the innocuous effect of arsenious acid when given to animals, reported that they had administered this mineral to 2 sheep taken from one of the slaughter-houses. They had been confined for 48 hours, and had little food consequently in their stomachs. To one they gave 5 grammes of arsenious acid, and to the other 10, mixed with double the quantity of common salt. Both the animals experienced such symptoms as to leave no doubt that they were suffering from the poison. In all probability they would have sunk; but, to make the experiment still more certain, a dose, equal in quantity to the first, was exhibited after the lapse of 24 hours. They died some hours after. On opening them after death, the characteristic marks of poisoning by arsenic were found in the stomachs. This salt was also discovered in the urine, blood, lungs and liver; very little however was detected in the muscles. As yet they have been unable to experiment on diseased animals, but those experiments they have already performed are at direct variance with the facts mentioned by M. Cambessido. How is this difference to be accounted for? Was the salt given by M. Cambessido impure? Was it arsenic? Or did some circumstances prevent the development of the poison in his hands?—As inserted in the *Lond. and Edinb. Med. Journ.* for February 1843.

#### *Analysis of a Calculus.*

Wurzer found, in a gray laminar stone which had been passed from a girl 17 years of age, and which possessed a decided smell of



cheese, 50·2 uric acid, 6·0 urate of lime with traces of soda, 32·2 mucous membrane, 10·0 water, and 0·5 of an acid animal substance soluble in æther, together with traces of iron and manganese. M. Wurzer ascribes the cheesy smell to the presence of *caprinate* of lime.—*Archiv der Pharm.*, xxv. p. 273.

*On the Preparation of Indigo-Blue in the Moist Way.*  
By J. FRITZSCHE.

When indigo-blue is conveyed into a hot alcoholic solution of potash or soda, and a hot solution of grape sugar in alcohol is added, or *vice versâ*, the indigo-blue is reduced in a few minutes, and if the atmosphere be entirely excluded a yellowish red solution is obtained, having a very agreeable smell of flowers; when exposed to the air it absorbs oxygen with great avidity and changes into blue, presenting, during its passage through all the various tints of red and violet, a most beautiful display of colours; at the same time it deposits indigo-blue in a crystalline state. When completely oxidized it forms a brown liquid, in which are suspended laminar crystals of indigo-blue, with their peculiar copper colour by sun-light. All the impurities in the indigo-blue are either left undissolved at the commencement, or remain in the solution, so that crude indigo may be operated on without its being previously purified.

With small quantities of the reduced liquid, even with from 8 to 12 oz., oxidation takes place with great rapidity when the red liquid is decanted from one glass into another; but the laminar crystals are thereby rendered much smaller than if the liquid had been left quiet and the oxidation allowed to take place gradually from above downwards. This however only causes the preparation to have a less brilliant appearance, but does not affect its purity; and when a large quantity of pure indigo-blue is wanted at a short notice decantation may be had recourse to.

4 oz. of pulverized indigo of commerce and 4 oz. of grape sugar were conveyed into a flask which might contain about 12 lbs., and then hot alcohol of 0·876 spec. grav. and 6 oz. of a very concentrated solution of caustic soda mixed with a sufficient quantity of hot alcohol added, the flask well shaken, entirely filled with alcohol, well corked and placed aside. After a few hours it had sufficiently clarified, and the clear portion was now transferred by means of a siphon into a larger vessel, which was loosely covered and left some days in quiet. When the oxidation and separation of the indigo-blue was complete, and the previously beautiful red liquid had acquired a brown colour, which did not undergo further change, it was filtered and the indigo-blue washed, first with alcohol and then with hot water, until what passed through was free from colour. This is the only purification requisite for indigo-blue prepared in this manner. A brown viscid mass, which is insoluble in alcohol, and separates from it in small drops, but easily soluble in water, deposits itself on the crystals. It appears to be a product resulting from the action of the soda on the grape sugar, and has



still to be examined. This substance renders it impossible to remove by means of alcohol those crystals which have deposited themselves on the sides of the vessel, which is however easily effected with water.

The indigo-blue obtained in the above experiment weighed exactly 2 oz., amounting therefore to 50 per cent. of the indigo employed. The filtered alcoholic liquid was again poured on the residue in the flask, together with fresh quantities of grape sugar and soda, but only afforded 1 drachm more, or about 3 per cent. of indigo-blue; and after dilution with water, filtration, and long exposure to the atmosphere, only a trace of indigo-blue was found to have remained in the solution. The excellence of this new method is therefore very evident.

The indigo-blue prepared in this manner forms a coarse powder, which in sun-light exhibits a bright copper colour, proving its crystalline nature. It is however impossible to determine the form of the crystals with the naked eye; under the microscope they appear to consist of thin laminæ, which accounts for their taking up so much room, 1 oz. occupying the space of about 3 oz. of water.

The brown liquid which is obtained in this process, and which deserves more accurate investigation, contains the greater portion of the organic substances of the indigo in solution, but not all in the state they were previous to the above treatment. This is evident from the circumstance, that indigo-blue, prepared by reduction according to the method generally in use, even after being treated with much alcohol, still contains indigo-red, and when brought into an alcoholic solution of soda, affords a solution of a beautiful red colour, which changes into brown by exposure to the air, without depositing the whole of the indigo-blue. It appears therefore that indigo-red likewise undergoes some change from the action of the oxygen when in an alkaline solution. On evaporating the alcohol, this liquid, which probably owes its colour to the indigo-red, deposits a substance which is insoluble in water, and that which still remains in solution is thrown down by acids as a flocculent brown precipitate.

One question still remains to be answered, and that is, into what products the grape sugar is converted in the reduction of the indigo-blue, and whether, when alcohol is used, formic acid is generated, as is the case, according to Liebig, on employing water. At all events, the action of grape sugar in hot aqueous and alcoholic liquids is energetic and momentaneous, and there can be no question of a fermentative process, as is sometimes stated.

On bringing indigo, grape sugar, solution of soda and hot water together, a liquor was immediately obtained, which, after subsidence, was drawn off with a siphon, and left to oxidize by exposure to the atmosphere. When the whole of the indigo-blue had separated it was filtered, and a liquid of brownish yellow colour, possessing the following properties, was obtained:—Acids produced a considerable bluish gray-green precipitate, which, after edulcoration and desiccation, still retained its colour, and dissolved for the greater part in alcohol with a reddish brown colour. On evaporation of the



liquid filtered from this precipitate, a resinous substance separated, of brown colour, somewhat soluble in water, and entirely in alcohol.

The liquid in question gave moreover, on being mixed with lime water, a bluish green precipitate (a combination of the indigo-brown with lime?); from the filtered solution acids threw down a greenish flocculent body, and the liquid, on being separated and evaporated, afforded a resinous body. It is very probable that we shall be able to obtain in this way, together with an examination of the alcoholic liquid resulting from the reduction of the indigo, further information relative to the nature of indigo-brown, of which very little is known.

The indigo-blue obtained in the way last mentioned requires a long time for edulcoration, and affords, on being treated with an alcoholic solution of soda, a considerable quantity of indigo-red. The property of this latter substance, of being dissolved by alcohol in presence of an alkali, affords a ready means of purifying indigo-blue, prepared by means of sulphuric acid, from indigo-red.—*Bullet. de l'Acad. de St. Petersburg*, i. p. 97.

#### *On some Double Salts of Uranium.*

The double salt of the acetate of uranium and acetate of soda, which had been examined by M. Duflos, and another double salt of acetate of uranium and acetate of potash, which had also been described, induced M. Wertheim to search for similar compounds; and he succeeded in obtaining double salts with very many acetates. These salts were prepared by first decomposing the crystallized nitrate of uranium so far by heat that a small quantity of the oxide of uranium was reduced to the state of protoxide, upon which the residue was dissolved in acetic acid, and any of the bases added to the filtered solution until some oxide separated, which was again dissolved in acetic acid. It is advantageous, and not injurious, to employ a small excess of the acetates. These double salts crystallize best from a somewhat acid solution; most of them are deposited from a hot concentrated solution upon cooling in well-defined crystals. The acetic acid was determined according to the well-known method by means of barytes, the oxide of uranium precipitated with ammonia, and this compound heated, by which the peroxide of the protoxide of uranium was obtained; the bases were determined according to the methods in general use, and the water by exposing the salt to a temperature at which the acetic acid is not decomposed, which, with the soda salt for instance, amounted to  $250^{\circ}$ . The salts were moreover incinerated, and the residue, which consists, with the fixed bases, of the base in combination with the oxide of uranium, weighed; the oxygen of the base is to the oxygen of the oxide of uranium as 1 to 6. Water extracts from the potash and soda compounds, even on boiling, no potash or soda; and when the silver salt is burnt, the oxide of silver remains behind in combination with the oxide of uranium. From the composition of the acetate of the oxide of uranium and soda, which is anhydrous, and which was moreover



heated in the state of powder to  $200^{\circ}$ , and was then incinerated, the atomic weight of uranium may be determined with tolerable certainty. According to the mean of three experiments it amounts to 740.512. The following double salts have been examined:—

Potash salt . . . . .	$\text{K O } \bar{\text{A}} + 2 \text{U}^2 \text{O}^3 \bar{\text{A}} + 2 \text{H O}$
Soda salt . . . . .	$\text{Na}^2 \text{O } \bar{\text{A}} + 2 \text{U}^2 \text{O}^3 \bar{\text{A}}$
Ammonia salt . . . . .	$\text{NH}^3 \text{H O } \bar{\text{A}} + 2 \text{U}^2 \text{O}^3 \bar{\text{A}} + 6 \text{H O}$
Magnesia salt . . . . .	$\text{Mg O } \bar{\text{A}} + 2 \text{U}^2 \text{O}^3 \bar{\text{A}} + 8 \text{H O}$
Zinc salt . . . . .	$\text{Zn O } \bar{\text{A}} + 2 \text{U}^2 \text{O}^3 \bar{\text{A}} + 3 \text{H O}$
Silver salt . . . . .	$\text{Ag O } \bar{\text{A}} + 2 \text{U}^2 \text{O}^3 \bar{\text{A}} + 2 \text{H O}$
Barytes salt . . . . .	$\text{Ba O } \bar{\text{A}} + 2 \text{U}^2 \text{O}^3 \bar{\text{A}} + 2 \text{H O}$

The form of the crystals of the potash and silver salts is a quadrate octahedron with square or quadratic prisms; the angles of the crystals, which differ somewhat from one another, render it not improbable that the oxide of silver and potash are isomorphous in these salts.—Poggendorff's *Annalen*, 1842, No. 11.

#### *On some Double Tartrates and Racemates.*

M. Mitscherlich has stated that the tartrate of potash and soda  $\text{K a O } \bar{\text{T}} + \text{Na O } \bar{\text{T}} + 8 \text{H O}$ , the tartrate of ammonia and soda  $\text{NH}^3 \text{H O } \bar{\text{T}} + \text{Na O } \bar{\text{T}} + 8 \text{H O}$ , and the racemate of ammonia and soda  $\text{NH}^3 \text{H O } \bar{\text{U}} + \text{Na O } \bar{\text{U}} + 8 \text{H O}$ , possess the same form of crystal. The specific weight of the first salt is 1.74, that of the second 1.58, and that of the third likewise 1.58, so that not only the relative position of the atoms is the same in these two latter isomeric compounds, but also the distance. He also obtained from a concentrated solution of racemate of soda and racemate of potash, especially on employing an excess of the latter, a double salt, which also consisted of equal atoms of the two substances, but had a different crystalline form from the corresponding tartrate. In his 'Manual' he has already stated that the 6 double salts which the oxalate of alumina, oxalate of the sesquioxide of iron and of chromium form with the oxalate of potash and ammonia, possess the same crystalline form, and that the 3 which they form with oxalate of soda are isomorphous *inter se*. When a solution of the oxalate of the sesquioxide of chromium and potash, and sesquioxide of chromium and soda, are allowed to crystallize, a combination is obtained which crystallizes in octahedrons. The same takes place when the salts of the sesquioxide of iron are employed instead of the chromium salts.—Poggendorff's *Annalen*, 1842, No. 11, p. 484.

#### *On a new Sulphuret of Bismuth.*

At the meeting of the Royal Academy of Sciences of Berlin July 18, 1842, Professor Mitscherlich communicated a notice of a new compound of sulphur and bismuth, which had been prepared by M. Werther, who examined some beautifully developed crystals



of the sulphuret of bismuth, which had separated from impure bismuth of commerce. As is well known, this metal is capable of dissolving the sulphuret in any proportion. When a solution, consisting of about equal parts of the two, is left to cool, the sulphuret of bismuth crystallizes first from it, and the metallic bismuth can be poured off; besides bismuth, these crystals contain some nickel and copper, but only so much sulphur that the quantity contained in the sulphuret which corresponds to the oxide is, for the same quantity of bismuth, as 2 to 3. To obtain this combination pure, the author conveyed pure pulverized bismuth into boiling sulphur; but although this latter was employed in excess, some metallic bismuth separated. He melted the powdered sulphuret again with sulphur, and increased the heat until the compound became entirely fused, which however could not be effected over an Argand lamp. The compound was crystalline, and here and there some isolated crystals had separated, the form of which was a prism of  $90^\circ$ . The edges were replaced by surfaces which had an inclination of about  $90^\circ$  to each other. Heated over an Argand lamp, this compound did not give off any sulphur, and it was found to contain, in one experiment, 86.203 bismuth, and 13.813 sulphur; in a second analysis, 86.340 bismuth and 13.502 sulphur. If the sulphur of this compound is to that of the sulphuret corresponding to the oxide as 2 to 3, the analysis should have given 86.865 bismuth and 13.135 sulphur. It results, from the composition of this sulphuret, that the earlier opinion of Berzelius, of the oxide of bismuth consisting of 2 atoms of bismuth and 3 atoms of oxygen, is correct.—Poggendorff's *Annalen*, 1842, No. 11.

*On the Employment of the Proto-ioduret of Iron in Consumption.*

By M. GILBERT BOISSIÈRE.

M. Boissière has drawn up the following paper, from observations he made on 27 cases under the care of M. Dupasquier, in the Hôtel Dieu of Lyons. This gentleman, in 1835, was the first who employed the proto-ioduret of iron in the treatment of phthisis. Previous to this time a salt of iodine and iron was known, but it was always prescribed in a solid form, and used only in scrofulous tumours, chlorosis and amenorrhœa. M. Dupasquier was the first who used this preparation in the form of a solution, and the results he obtained from it were very different from those that followed the employment of the proto-ioduret in the solid form. M. Boissière begins his paper by describing the physiological action of the remedy. The first symptoms appreciable after taking it are, headache, increase of pulse, bitter taste in the mouth, anorexia and thirst. These are succeeded by nausea and vomiting, some irritation of the alimentary canal, general turgescence of the capillary system, cough, sometimes slight hæmoptysis, noise in the ears and want of sleep. After having described these symptoms in a lengthened manner, he proceeds to speak of its action in consumption, and to detail its effect on each particular symptom of the disease. It is



unnecessary for us to mention each of these in succession ; suffice it to say, that during the first few days of its administration, the cough becomes more frequent and the expectoration more abundant and free ; but both of these soon diminish to such a degree, that sometimes from the fourth to the fifth day of its administration, a patient, by the end of three weeks or a month, who was never free from the cough for a quarter of an hour, is not troubled with it oftener than 4 or 5 times, and occasionally not more than once or twice daily. In cases where all the signs of tubercles in a crude state were found, as prolonged expiration, dullness on percussion, &c., these have entirely disappeared, and M. Boissière thinks it right to conclude that the disease was cured. In other patients, again, where caverns existed, the symptoms have been much ameliorated ; and in two, both the pectoriloquy and *gargouillement*, which were very distinct before the medicine was taken, could no longer be detected after it had been persevered in for some time. From all the observations he has made, M. Boissière is of opinion that the physiological and therapeutic properties of proto-ioduret of iron resolve themselves into a tonic, astringent and resolute action. As a tonic, it excites all the functions, particularly that of digestion, hæmatose, and assimilation ; as an astringent, it diminishes the increased secretion of the mucous membrane and the nocturnal sweats ; and as a resolute, it stimulates the absorption of the organic products deposited in the pulmonary tissue ; and he might add to these, he says, the power it possesses of favouring and hastening the cicatrization of the cavities, if this latter was not contained in the other three. It would appear then that this medicine is not only innocuous, but of great utility in phthisis pulmonalis, and that there is no other remedy which can bear a comparison with it. Owing to the rapid oxidation of the proto-ioduret of iron, it ought only to be prepared when it is required ; if however it is necessary to keep it ready-made, the syrup of gum is the best vehicle in which it can be preserved, as the sugar and the gum have the effect of preventing the oxidation of the iron. It ought to be kept from the air, and at a moderate temperature. After the syrup of gum, the next best mode of administering it is a mixture containing gaseous or distilled water. When decomposition has commenced, it is recognized by the liquid assuming a greenish and then a reddish brown colour. When it is kept in the syrup of gum, this salt may remain for a fortnight, or even more, without decomposition occurring. Every drop of the preparation employed by M. Dumasquier contains 1 gr. of the protiodide, and the ordinary dose per day is 15 drops, increased to 120, beyond which it ought not to be pushed. When given in this quantity, it is either continued for some time, or if any unpleasant symptoms follow it is suspended for a week, or until they subside ; and after their disappearance it is to be again begun in the dose of 15 or 20 drops. In children or very weak people, the treatment may be commenced with 10, or even 5 drops a day. M. Dumasquier employs at the same time the remedies commonly had recourse to in phthisis, and he recommends his patients to eat as much animal



food as possible, and to keep themselves warmly clothed.—Abridged from *Gazette Méd. de Paris*, 24th Dec. 1842, as given in the *Lond. and Edinb. Med. Journ.* for Feb. 1843.

*New Resin from Pinus Abies.*

At the late meeting of the Scandinavian Naturalists in Stockholm, M. Berlin communicated a notice of the occurrence of a resin in the cavities of *Pinus Abies* in Noorland, which the country people chew, and therefore call *tugghåda* (chew resin). It contains an aromatic essential oil, quite distinct from oil of turpentine, and resins differing entirely from those which generally exude from that tree, and moreover a new crystalline acid, which may be extracted with water.—*Augsb. Allgem. Zeitung*, No. 307.

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## ANALYTICAL CHEMISTRY.

### *Determination of Uranium.* By M. EBELMEN.

THIS metal is generally determined in the state of the green oxide; it is usually precipitated from its solutions by ammonia, and the precipitate heated, in order to convert it into the green oxide. The tendency of the oxide of uranium to combine with bases gives rise to its frequently carrying down along with it oxides which are not precipitated by ammonia, such as barytes and lime. If the liquid contain much potash, a considerable quantity is often found in the precipitate, which is easily recognized by the orange yellow colour perceptible at various parts of the heated precipitate.

The precipitate produced by ammonia in salts of uranium must be washed with a solution of the chloride of ammonium, in order to prevent its passing through the filter and rendering the liquid turbid, which always happens whenedulcorated with pure water.

Sulphuretted hydrogen separates uranium from a great number of metals. The oxide of uranium may be separated very easily from the peroxide of iron by means of carbonate of ammonia; but those metals whose oxides dissolve, in part or wholly, in carbonate of ammonia, such as manganese, zinc, cobalt and nickel, have been regarded as difficult of separation from uranium. The use of the carbonates of soda and of potash affords a very exact and simple means of effecting their removal.

The uranate of potash is not soluble in the subcarbonate of potash, but it dissolves completely, and in very little time, in a liquid saturated with a bicarbonate alkali. When a solution of a salt of uranium is precipitated with a slight excess of carbonate of potash, and the liquid is diluted with water, the whole of the uranium is dissolved, and imparts to it a yellow colour. In both cases the double salt of potash is formed. The carbonates of zinc, cobalt,



and of manganese, are, on the contrary, insoluble in carbonate of potash. To effect their separation the solution may be thrown down either by potash, the precipitateedulcorated and digested with bicarbonate of potash, which will only dissolve the oxide of uranium; or by a slight excess of carbonate of potash, the precipitate collected on a filter and washed as long as the liquor which passes is coloured.

The presence of phosphoric acid does not prevent the oxide of uranium being dissolved by an excess of carbonate of potash; but it is necessary to employ a larger quantity if there be not sufficient sesquioxide of iron to retain the whole of the phosphoric acid. On adding to a solution of the phosphate or arseniate of uranium, in an excess of carbonate of potash, a known quantity of sesquioxide of iron dissolved in nitric acid, those two acids may be completely separated from the uranium, and their proportion determined by the increase in weight of the peroxide of iron. The oxide of uranium may also be separated by potash, and the phosphoric and arsenic acids left in the solution.

To separate the oxide of uranium in solution, it may be saturated with hydrochloric acid, boiled to expel the carbonic acid, and the uranium precipitated by ammonia; but as the liquor contains much potash, the precipitate retains a certain quantity, and is not entirely converted into the state of green oxide, which makes it necessary to redissolve it and precipitate again with ammonia.

It is advantageous to add caustic potash to the solution of the double carbonate; the whole of the uranium is then deposited after a certain time in the state of uranate of potash; the liquor decanted and the precipitate washed, in order to get rid of the greater portion of the alkali. It may then be redissolved in hydrochloric acid and precipitated with ammonia.

To extract uranium with great precision from the uranate of potash dissolved in hydrochloric acid, the whole is evaporated to dryness in a platinum crucible gradually heated, and a current of dry hydrogen conveyed into it, as long as the gas which is given off possesses an acid reaction. The double chloride of potassium and uranium is converted in this manner into so-called uranium, and the chloride of potassium, which may easily be separated by water, when the uranium remains behind as a black powder.—*Ann. de Chim. et de Phys.*, Juin. 1842.

#### *Separation of the Oxide of Chromium from Alumina.*

In most works on analytical chemistry it is stated that, in order to separate the oxide of chromium entirely from alumina, the mixture should be fused with an excess of carbonate and nitrate of potash, by which the oxide of chromium is converted into chromate of potash, and the alumina remains behind. According to Dr. Schaffhaeutl, however, when only a trace of nitrate of potash is employed, and the mixture is melted for any length of time, a portion of the alumina always dissolves along with the chromate of potash, and



the fusing with carbonated alkali alone, has but a very inconsiderable action on the chromium. When the precipitate obtained with ammonia, which contains the oxide of chromium and alumina, is conveyed into a hot concentrated solution of caustic potash, and the whole boiled down till near solidification, not a trace of alumina dissolves on cooling in water, and which after incandescence has no longer any (sometimes a very slight greenish yellow) colour.—*Ann. der Chem. und Pharm.*, Oct. 1842, p. 53.

## PHARMACOLOGY.

*On Coca and Matico.* By Dr. MARTIUS.

A FEW weeks ago I obtained a small sample of the famous *Coca* or *Ypadu* of the Brazilians. It consists of the leaves of *Erythroxylon Coca*, of which I have given a short notice in my 'Outlines.' This herb appears to be as highly valued in Peru as the *Maté* in Paraguay. The *Coca* is the leaf of a shrub which grows especially in Bolivia beyond the Andes. The Indians chew the leaf nearly in the same manner as tobacco is used in Europe; they take just so much as they can conveniently hold between the thumb and two next fingers, moisten it sufficiently with saliva, then mix a little unslacked lime with it, and form the mass into a ball or pellet, which they place in the mouth, and on which they subsist sometimes for days, now and then renewing the ration. Messengers who undertake journeys, which frequently last from 10 to 12 days, and during which the Indian seldom lays himself down to sleep, but merely leans himself, sometimes for half an hour, against a tree or rock, have only their *Coca*, besides which they take once or twice daily a spoonful of meal of roasted maize mixed with water. Thus, for instance, I have been informed, on good authority, of a journey of 530 miles, which were accomplished in 175 successive hours, and with no other sustenance. In the mines the Indians work by twos, 24 hours together, one resting when the other works. The labour is very hard; the pieces of ore are broken from the rock with a hammer 24 lbs. in weight, and a chisel weighing no less than 2 to 3 lbs. During the whole time the Indian has only his *Coca*, with lime and the maize meal, and after 24 hours' work as much rest. Among the wild Indians the chewing of the fresh *Coca* has become a vice, as among the Chinese the smoking of opium; it renders them imbecile, drives them into the woods, so that they can no longer remain under roof, and at last die in the open forest, naked as the beast, in wild madness.

I also obtained with the above a sample of another vegetable, which is very highly valued in Peru, and if I do not err belongs to a *Phlomis*. It is the *Matica* or *Matico*, of which a short account is given in the 'Dictionaire' of Merat and Lenz. The sample was accompanied with the following notice:—

"*Matico*, a tree which grows wild in the interior of Peru, the



other side of the Andes, the leaf of which possesses great medicinal virtues, and the use of which has been learned from the Indians, and is as follows :—The leaf is dried or roasted on the fire, but must not be touched by the flame or burnt. It is then powdered, passed through a fine sieve to remove all the larger particles, and the fine powder is the remedy for external wounds. I have tested it on a horse, which had an open wound on its back 8 inches long, which was much swollen, and contained much rank flesh. The wound was washed with lukewarm water and a soft sponge, and the Matico powder then scattered thinly over it, and this proceeding repeated every 24 hours. In 5 weeks the wound was not only healed, but overgrown with hair; and for 2 years after, during which time I had the horse in use, and rode him very much, the wound did not open again, although after a long ride a small swelling sometimes showed itself, which however in one or two days disappeared again.

The Indians, a very sensual race, are also said to prepare a beverage from the fresh leaves, which they give to the women as an aphrodisiac, and further infusions of the male and female flowers, which they give for that purpose reciprocally to each sex. The Indians are also said to assert, that the fresh leaf has virtue sufficient to stop bleeding at the pulse, even if cut through, instantaneously, and to stanch the vein; but this latter report is merely from hearsay.—*Pharm. Central. Blatt.*, Jan. 4, 1843.

#### *Castor Oil.*

According to M. Siller, the *Ricinus* is sown in Armenia among the cotton seed. It does not thrive in high and bleak places. The seed, the entire annual produce of which amounts in Armenia to about 10,000 cwt., is roasted in copper pans, then ground on flat stones, the thick mass which results boiled in water, and the oil skimmed off. In this manner about 25 per cent. is obtained, which is consumed for the greater part as burning oil\*. A better kind is prepared from the shelled seed. The chemists of Tiflis purchase the seed and press it in screw-presses, which method is also followed in Sarepta; and this Russian oil is of a brighter colour, and far superior in purity, smell and taste to any of the Armenian.—*Archiv der Pharm.*, xxx. p. 363.

## CHEMICAL PREPARATIONS.

### *Preparation of Calomel in the State of an Impalpable Powder.*

By E. SOUBEIRAN.

THE combined experience of the physician and of the chemist have proved that the extreme division of calomel adds considerably to its medicinal energy. Porphyrisation does not attain the object;

\* The price of this article is now so low that a quantity of American oil is employed at present in this country for making soap.—*Ed. Chem. Gaz.*



it only furnishes a yellowish powder, which never possesses the necessary degree of division. Josiah Jewel, who first attempted a different method of preparation, proposed bringing the vapour of the protochloride of mercury into a vase containing some water. This water soon boils, and its vapour mixes with that of the mercury. The presence of the water and the vapour prevents the adhesion of the sublimate, and the produce has the appearance of a subtle and uniform powder.

If this process of Josiah Jewel was not absolutely impracticable, it is at least certain that it hardly gave any produce, and it was therefore soon abandoned. In 1822 M. O. Henry, by a happy modification of apparatus, at last presented our laboratories with a practical process, which has been adopted by all authors, and which is the only one that is noticed in chemical works. M. Henry entirely separated from each other the vessel in which the aqueous vapour was generated, and that in which was produced the vapour of the mercurial chloride; the two vapours being made to enter a recipient, at the same time became there intimately mixed, and the calomel was precipitated in the form of a white and finely divided powder. This operation is difficult of execution, and frequently the results are compromised by the breaking of the vessels.

This process is however the only one followed in our laboratories; and French physicians at present make use of the protochloride of mercury almost exclusively. The calomel prepared in France cannot however bear comparison with that which is imported from England as to whiteness and the fine state of the powder.

To obtain a better product, and to render the operation easier, instead of the vapour of water, which interposes between the particles of the sweet mercury, and hinders them from uniting, I have proposed to substitute a current of air, which passes over the heated calomel, carries off the vapour as it is formed, and deposits it in the form of a minutely divided powder. The apparatus is composed of an earthen tube placed across a furnace, into which the calomel is brought in pieces and heated. The blast of a ventilator of centrifugal force is constantly directed into the interior of the tube, which sweeps off the vapour, and carries it into a recipient. By only opposing straight tubes to the current, the calomel is so fine that it would be carried to a great distance, and it is best to make the current pass into a chamber of a metre and a half to two metres square, divided into three stories by means of little shelves. The lower story communicates with the following by a large slit, contrived on the opposite side to that by which the calomel enters; from this second story the current passes into the third, and is then carried off by a tube, the extremity of which is immersed in a small quantity of water. The air, forcing its way out, drives back the water, produces a gurgling, which moistens the particles of the calomel that may have got so far, and causes their precipitation.

I have made many experiments for the purpose of investigating this process in all its details, and I have succeeded in making the operation regular and the products very satisfactory; and by con-



tinual attempts I have succeeded in reforming the new process itself, and at present I neither employ steam nor a current of air. My apparatus is simply composed of a tube and of a recipient. I obtain the most beautiful divided calomel by so simple a manipulation, that I have often asked myself how it had not struck me at first. It is founded on an analogous operation, widely practised in the arts, viz. the manufacture of flowers of sulphur.

In preparing flowers of sulphur, the vapours are conveyed into a chamber so large, that the latent heat given off by the sulphur, which becomes solid, only warms the sides of it to such a degree, that the sulphur which becomes attached to them fuses. I had not paid sufficient attention (and doubtless it is so with many others) to the fact that the solidification takes place at a distance from the walls of the chamber; and from the air which is mechanically interposed presenting an obstacle to the union of the particles at the moment when solidification takes place; and, moreover, not finding any point of support, they cannot be deposited and unite in the symmetrical arrangement which crystallization would require. If the vapour of sulphur were to solidify on the sides of the chamber, it would be deposited in crystalline agglomerations, and not as powder. Thus then the formation of the powder of sulphur takes place in the very midst of the atmosphere of the chamber, and this powder, yielding to its own weight, is slowly deposited. It was only necessary to apply this process to the preparation of finely divided calomel, and to determine some circumstances favourable to the success of the operation.

The vessels in which I heat the calomel are long earthen tubes of 10 centimetres in diameter, and from 50 to 60 centimetres in length. They are closed at one end and open at the other; each of them may contain from 4 to 5 kilogrammes of sweet mercury.

The tube is placed in a long furnace; a piece of it, about 4 centimetres long, comes out at one of the sides, and is inserted into the recipient even with the side. The recipient should be brought as near as possible to the furnace, in order to prevent the calomel from condensing in the end of the tube; for the same reason the tube should be even with the wall of the recipient, and should not project into the interior. On the other hand, the recipient must be protected from the heat given off by the furnace; for this purpose the opening by which the tube comes out of the furnace is closed with clay, and two metallic diaphragms, which surround the tube on the outside of the furnace, being interposed between it and the recipient, shelter the latter from the radiation. Thus these two conditions, essential to success, are united; the tube is heated very near to the place where it enters the recipient, to prevent the calomel from condensing there; and the recipient is sheltered from the heat of the furnace; for if the temperature were too high, the calomel, at first deposited as powder, would unite in crystalline agglomerations.

Nothing can be more simple than the management of the fire; the tube is at first heated to a dull red in the part nearest to the recipient, then by degrees the fire is carried the whole length of the



tube. An hour and a half to two hours are sufficient for the entire volatilization of 4 to 5 kilogr. of sweet mercury.

When the operation is finished, the apparatus is left to cool, the clay stopper is taken away, and the calomel washed with distilled water until the water is no longer coloured by sulphuretted hydrogen; it is then dried at a gentle heat.

Such is the simple process to which I have come; and I have been assured that it is precisely that which the English manufacturers keep concealed. Whether it be so or not, the calomel which it furnishes bears comparison with the most beautiful brought from England. I am occupied in applying this process of division to other volatile mineral substances. I have already succeeded perfectly with some; the operation only presents difficulties in those cases in which the substances undergo a change from contact with the air at a high temperature, such as orpiment and vermilion.—*Journ. de Pharm.* Nov. 1842.

#### *Composition of the Seignette Salt.*

In some works on chemistry the constitution of this salt is represented by the formula  $K O \bar{T} + Na O \bar{T} + 10 H O^*$ , which however it is not in the least entitled to†. From several analyses made by M. Schaffgotsch with glass of borax, he found it to contain in 100 parts—

	Found.	Calculated.	Atoms.
Potash .....	16.60	16.68	= 1
Soda .....	11.18	11.05	= 1
Tartaric acid.....	47.00	46.83	= 2
Water .....	25.22	25.44	= 8
Seignette salt .....	100.00	100.00	

The mode of examination consisted in incinerating the pulverized salt, determination of the amount of bases by glass of borax, and determination of the potash from the hydrochlorate solution of the incinerated salt with chlorine of platinum. The soda was found by loss, the tartaric acid by calculation, and what was still wanting was considered as water.

The same formula for this salt, viz.  $Ka O \bar{T} + Na O \bar{T} + 8 H O$  has also been obtained by E. Mitscherlich. At a temperature of 212° Fahr. it gives off 6 atoms of its water.—Poggendorff's *Annalen*, 1842, No. 11, p. 485.

#### *Mezereon Ointment.*

M. Hoffman of Landau gives the following formula for the preparation of this ointment:—Take alcoholic extract of mezereon bark, 4 scruples; alcohol, 15 scruples. Dissolve, and add 230 scruples of lard and 30 scruples of white wax. Mix. This ointment may be employed to keep up suppuration, or as a revulsive in frictions on the skin.—*Provincial Medical Journal*, Nov. 5, 1842.

\*  $\bar{T} = C^4 H^2 O^5$ .

† Turner and Phillips give correctly 8 atoms of water.



*Preparation of Flores Benzoës.*

Geiger conveys 12 oz. of coarsely pounded benzoe resin, mixed with sand, into a flat iron vessel capable of holding from 2 to 4 lbs. It is heated on the sand-bath, and the aperture of the vessel loosely covered with bibulous paper, and a stick placed inside supporting 4 or 5 horizontal round discs of paper at some distance above the mixture. A double case of bibulous paper, in the form of a sugar-loaf, is then placed over the whole, and fastened by a thread round the margin of the vessel. After 6 to 8 hours it is allowed to cool, and the benzoic acid removed from the caps and discs, fresh paper placed over the aperture, the caps readjusted, and a stronger heat now applied for some hours. This may be repeated to advantage a third time. The white crystals are carefully separated, but those which are coloured are pressed between blotting-paper and again sublimed. 12 oz. of good benzoe afford, in this manner, 10 to 11 drachms of the best benzoic acid. Some acid may also be extracted from the papers.—Geiger's *Repert.*, 1842, p. 219.

*Proto-ioduret of Mercury.*

To obtain this preparation of a very beautiful colour, M. Nölle recommends mixing a dilute solution of iodide of potassium (1 in 32 of water) with a slightly acidulated solution of protonitrate of mercury in 24 times its weight of water.—*Arch. der Pharm.*, xxxi. p. 183.

*Benzoic Acid in Rad. Inulæ Helenii.*

Röttsher found acicular crystals of benzoic acid in a vessel which had been filled with an alcoholic *Extr. Inulæ*.—*Arch. der Pharm.*, xxx. p. 169.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the History and Manufacture of Boracic Acid in Tuscany.* By M. PAYEN.

THE works established for the extraction of boracic acid in Tuscany greatly interest observers. They are situated on a gently sloping ground, which is constantly disintegrated by currents of gas and of vapours, which project liquid columns in the middle of small basins of water, and afterwards rise into the air in whitish clouds.

At the bottom of these hills are situated the manufactories, not less than 9 in number, at a short distance from each other. They are named Larderello, Monte-Cerboli, San Frederigo, Castel-Nuovo, Sasso, Monte-Rotundo, Lustignano, Serrazzano and Lago.

In these establishments, in which an enormous mechanical force



is incessantly manifested, and an evaporation exceeding 80,000,000 of kilogrammes effected, in which an annual production of 750,000 kilogrammes of crystallized acid is realised, neither machines, nor crude substances, nor combustibles, are perceptible! The soffioni furnish everything; it is merely requisite to give their powerful blast a proper direction to obtain both the crude solution and the heat required.

Many difficulties have impeded this manufacture; but M. Lardelle has succeeded in overcoming the most serious by substituting, instead of the expensive wood fuel, a most happy application of the superabundant vapour which everywhere escapes from the soil.

Before describing the actual processes of manufacture, and proposing a probable theory and possible improvements, I will give the results of my researches as to the nature of the gases, and of the substances which they carry with them into the lagoons.

The non-condensed gases were found to consist in 100 parts of—

Carbonic acid . . . . .	57.30
Nitrogen . . . . .	34.81
Oxygen . . . . .	6.57
Sulphuretted hydrogen . . . . .	1.31
	<hr/>
	100.00

The condensible products and the substances conveyed by the currents of vapour vary: generally they comprise water, clay, sulphate of lime, of ammonia, of alumina and of iron, hydrochloric acid, organic substances with a *marine* smell, and, lastly, little or no boracic acid; they deposit sulphur in all the narrow fissures and porous bodies which they traverse. The temperature of these vapours was found to vary from between 206° Fahr. to 212°. With these observations we shall be able, in connexion with what follows, to offer a probable theory of the production of boracic acid.

It has been found impossible to obtain this acid by condensing the vapours of the soffioni even in very large and long tubes; to obtain it, it is requisite that their apertures should be directly covered by the liquid of the basins; it is frequently observed that a portion of the water absorbed when these lagoons are filled, is subsequently thrown up by the vapour.

Thus the cause of the currents of gas, and of the elevation of the temperature, appears to have remained constant for many years, whilst the production, or at least the arrival of the boracic acid at the surface of the soil, seems to depend on the introduction of water into the fissures.

Suppose the water of the sea percolating through some fissure to a great depth had its temperature raised to a high degree, and that it found in the soffioni an issue for its vapours, all these phænomena would be intelligible; for the vapour mixed with the projected water, in passing over the deposits of boracic acid, would carry this with it, and by the reaction of the organic matter contained in it on the sulphates would produce sulphurets, from which boracic acid would expel sulphuretted hydrogen.



These facts admit however of a more chemical explanation. Let us suppose, with M. Dumas, that a deposit of sulphuret of boron, situated at a great depth, came in contact with sea water, a considerable action would take place, from which would result boracic acid, sulphuretted hydrogen, a high temperature which would carry off these products with the water, hydrochloric acid arising from the decomposition of earthy chlorides and ammonia produced by the organic matters. If the action took place not far from the calcareous mass, the boracic acid conveyed in the current of vapour would decompose the carbonate of lime, and the equivalent of carbonic acid would mix with the other gases; at a certain distance the sublimed boracic acid might form deposits, and according as the water of the lagoons descended to this point or not, the current would again carry up with it boracic acid, or pass without volatilizing it.

The air furnished by the sea water would enter the fissures, and in the presence of sulphuretted hydrogen would determine the formation of sulphuric acid. This, in its turn, would produce sulphates of lime, of ammonia, of alumina, and of iron, taking the lime from the calcareous mass, the ammonia from the vapours, the alumina and iron from the clay. These different salts, which are formed or which dissolve in the waters near the surface of the soil, explain the disintegration of the latter. The appearance of sulphur, and the presence of a little oxygen, which accompany the various substances contained in the soffioni and in the troubled waters of the lagoons, would result from the accidental introduction of air\*.

The methods adopted in the nine manufactories are, with some slight modifications, identical; they consist in the construction of rude circular basins around each of the centres of eruption, where two or several of the more considerable fissures terminate; and further, in conveying into the highest of these basins or lagoons, A, the water of some neighbouring springs. After remaining there for 24 hours, during which these waters have been constantly agitated by the subterraneous vapours, the plug *o* is opened, and the liquid passes by a small canal, *mn*, into the lower lagoon B, where it is confined for the same time, and becomes charged with more boracic acid, and the accompanying substances. The solution is successively passed into the lagoons C, D, and the liquid drawn off from an inferior basin constantly replaced by that contained in the one above†.

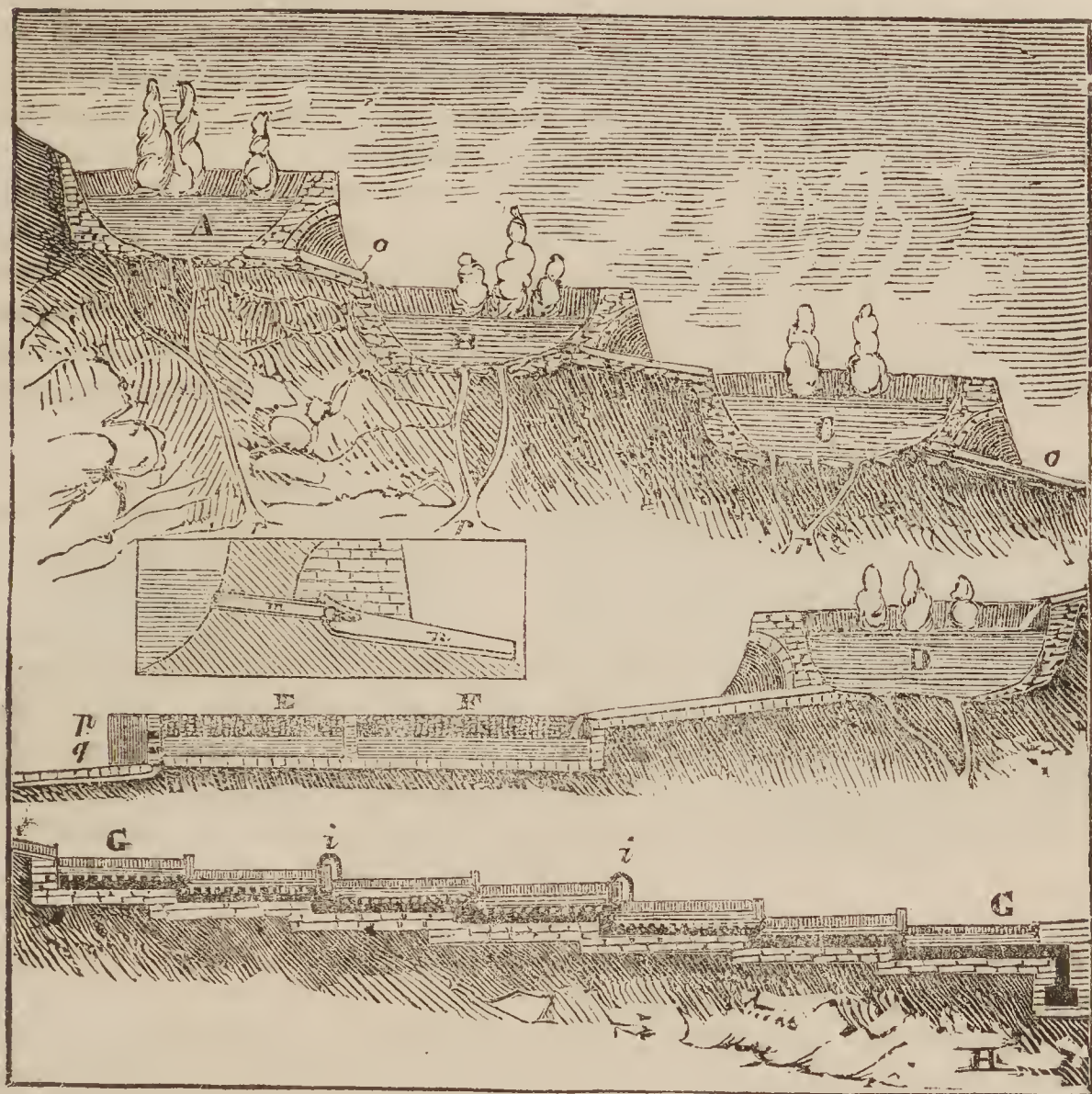
When a solution has arrived at the last lagoon D, and is sufficiently saturated, it is transferred into a reservoir or cistern E, six metres square and one deep, where the greater portion of the sediment is deposited.

\* Another cause may have a great influence in the production of boracic acid, for instance the reaction of sulphuric acid, so abundant in the masses of disintegrated soil on the anteriorly formed borate of lime. It is possible that one day some of these deposits of borate of lime may be discovered by means of excavations and analysis.

† All experiments made with a view of obtaining direct the boracic acid by condensing the vapours in conduits have been in vain; only an acidulated water, containing no boracic acid, was obtained.



The supernatant liquid is decanted either into a second reservoir F, or direct into two batteries, each of 7 leaden evaporating pans, G G,



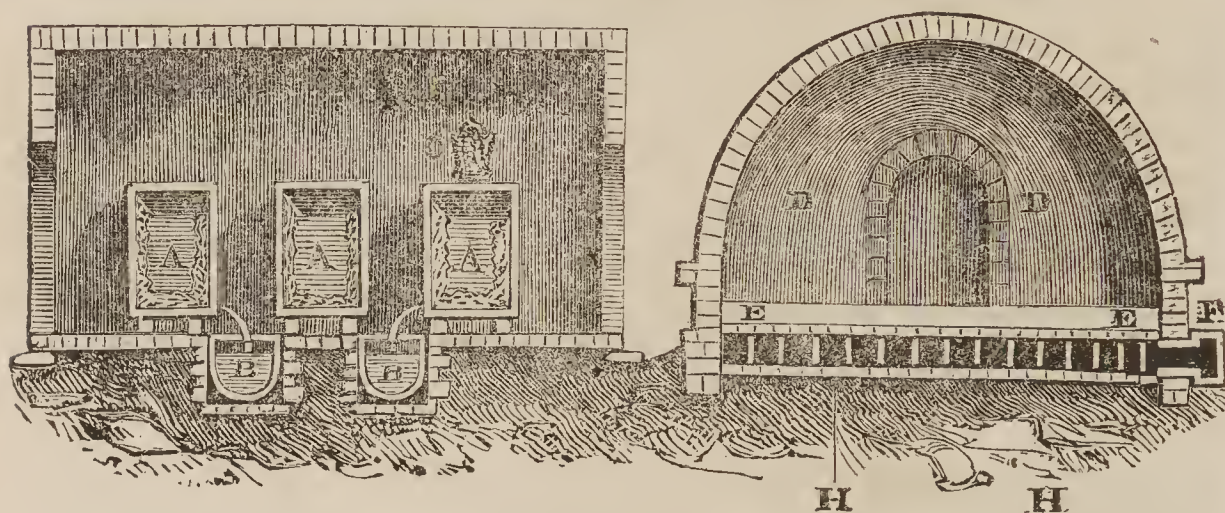
2.90 in breadth and 0.35 in depth, supported by strong wooden rafters above the masonry on an inclined plane, which allows the vapour of some soffioni inclosed in drains, and which enter at H, to ascend freely beneath the pans, which are arranged on different levels, to the upper portion, where the excess is given off outside the manufactory. The solution of the boracic acid in the reservoirs usually has a specific gravity of  $1^{\circ}$  to  $15^{\circ}$ .

The four first pans of each double range are filled with the clear liquid by removing the upper plug *p*. At the end of 24 hours, the solution, diminished to about one-half of its volume, is transferred by means of siphons into the next pans of each range, which is replaced by the product of a fresh decantation from the reservoir. 24 hours later, the solution, again reduced to half of its volume, is removed by means of siphons into the two last pans, while the two superior ones are again charged as before. The evaporation in the two last pans is continued for 24 hours, and the mother-waters of a preceding crystallization mixed with it; the mixture then indicates from  $10^{\circ}$  to  $11^{\circ}$  at a temperature of from  $173^{\circ}$  to  $176^{\circ}$



Fahr. The whole of this solution is then brought into the crystallizing tubs, which are constructed of wood and lined with lead. Here the crystallization is effected, and the produce of 72 hours' evaporation derived each day from a battery of 14 pans affords 90 kilogrammes of saleable boracic acid. This product diminishes in rainy weather. During evaporation abundant deposits of sulphates of lime are formed, which have to be removed.

When crystallization is at an end the mother-ley is drawn off and added to the last evaporating pans; the acid is placed in baskets, C, to drain; it is then carried into the drying-room and spread into layers on the floor, and turned from time to time; when it no longer moistens the hand on being pressed, it is formed into heaps, packed in casks and forwarded to Leghorn. The drying-room is con-



structed of bricks, and has a double floor, between which the vapour of some soffioni circulates.

The different manufactories contain from 1 to 5 batteries of from 14 to 16 pans, and each from 3 to 25 lagoons. In the manufactory of Larderello, which is the most considerable, there are 80 evaporating pans.

The largest lagoons, which are of an irregular circular form, are from 15 to 20 metres in diameter, and the smallest from 4 to 5 metres; their depth varies between 1.5 to 2.5. The liquid attains in them a temperature of from 200° to 203° Fahr.

Unfortunately the impurity of the acid increases each year, which is probably due to the progressive alteration of the disintegrated strata by the currents of vapours and the infiltrations of water. The first products contained from 90 to 92 per cent. of pure crystallized acid, at present they contain from 18 to 25 per cent. of foreign matters\*.

These impurities render it unfit for several applications, and occasion a useless expense in transport. They might be got rid of by subjecting the drained acid to strong pressure, purifying the product by washing and treating the mother-leys apart, which would

\* An analysis of the crude acid by M. Wittstein was inserted at p. 90 of this Journal.—Ed.



afford alum that might be turned to account, and residues of sulphate of lime, clay, &c.

Has, however, the maximum of production been attained?

This is not probable; to be convinced of this, and to find out the conditions favourable to a larger produce, it would be necessary to examine whether there exist accessible deposits of borate of lime, and to submit to numerous analyses the waters of the lagoons after they have been in contact with the vapours a certain time. In this manner the proportions of acid corresponding to the modified circumstances would be found. Perhaps frequent additions of cold water into the soffioni, after having been left dry for some time, would be favourable to a more abundant extraction of the acid contained in the subterraneous deposits.

[A very excellent abstract of the process of manufacture as described in the above paper, has been given by Dr. Pereira in his valuable work on *Materia Medica*, and an exceedingly interesting article on the same subject by Dr. J. Bowring, appeared in the *Philosophical Magazine* for July 1839. No notice, however, having appeared in English of M. Payen's views on the origin of the acid, we have been induced, from the interesting nature of the question, to place the entire memoir before our readers.—W. F.]

## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

*Jan.* 17, 1843.—Prof. Thomas Graham, President, in the Chair. A paper was read, entitled, “On the Changes in Composition of the Milk of a Cow, according to its Exercise and Food.” By Lyon Playfair, Ph. D.

The author of this paper states its principal object to be, to draw the attention of practical men to the conditions which effect a change in their dairy produce. After pointing out a defect in the mode of analysing milk practised by MM. Boussingault and Lebel, Dr. Playfair describes a modification of that method, which he practised and recommends as more exact. The cow being in good milking condition and at the time fed upon after-grass, he ascertained the average amount of her milk for five days, and then proceeded to analyse it. In the first day it was observed that the milk of the evening contained 3·7 per cent. of butter, and of the following morning 5·6 per cent. The deficiency in the first observation is referred to the consumption of a greater portion of the butter or its constituents, from respiratory oxidation during the day when the animal was in the field, than during the night when it was at rest in the stall. When confined during the day and fed with after-grass in a shed, the butter amounted to 5·1 per cent. When fed with hay, the butter was 3·9 and 4·6 per cent. When fed with portions of potatoes, hay and bean flour, the butter was 6·7 and 4·9 per cent. With hay and potatoes 4·6 and 4·9 per cent.

The author then examines Dumas' theory of the origin of fat in



animals in reference to the foregoing experiments, and concludes, in opposition to that theory, that the butter in the milk could not have arisen solely from the fat contained in the food. Hence it must be produced by a separation of oxygen from the elements of the unazotized ingredients of the food of the animal, in the manner pointed out by Liebig. He then quotes, in favour of the same conclusion, several experiments of Boussingault, and observations of dairymen in different localities. Potatoes are particularly favourable both to the flow of milk and increase of butter, from the starch they contain; so is malt-refuse. Porter and beer are also well known to be favourable to the production of butter both in the milk of woman and of the cow, although these fluids do not contain fat.

The production of caseine in the milk is then considered in reference to the quantity of albumen in the food supplied on different days to the cow, and to the supposed destruction of the tissues by muscular exercise. Pasturing in the open field is more favourable to the formation of caseine, while stall-feeding is more favourable to the formation of butter.

It is then shown that the proportion of butter in the milk of woman is increased by rest and the diminution of the respiratory oxidation; and the paper concludes with some practical remarks on the mode of preserving milk.

#### *Meeting of the Royal Institution.*

Friday, Jan. 27, 1843.

The lecture for this evening was by Professor Brande, and the subject, starch. After tracing the origin of the varied kinds of this substance which are commonly met with in everyday life, as the varieties of starch, sago, tapioca, arrow root, *tous les mois*, &c., and describing the sources from which they are derived, the Professor exhibited the properties of gluten and its solubility in acid or alkaline menstrua, and entered very fully into the manufacture of the ordinary starch from wheat, and that lately introduced made from rice; the first through the medium of acids, produced by the slow fermentation of the wheat, and in which the gluten is soluble while the true *fecula* subsides; and the latter by the employment of caustic soda as a solvent for this azotized body. The various stages of these processes were fully treated of, and the peculiar characters of the resulting substances exhibited. The properties of starch, its tests by solutions of iodine in an uncombined state, and the means of rendering it free when in combination by chlorine and galvanic agency, were beautifully shown by two well-conceived illustrations; one of them consisted in a small flask filled with chlorine gas, attached to a long cylindrical exhausted receiver, in which had been placed a card with the word *starch* written on it in large characters, with a mixture of an iodide and solution of starch. On opening the communicating stopcocks so as to admit the chlorine, the iodine was gradually liberated, and, acting on the starch, the letters became of a deep blue colour.

The employment of starch in stiffening and dressing various fa-



brics, as calico, linen, &c., in the manufacture of British gum and dextrine, the peculiar actions of sulphuric acid and diastase in the formation of sugar, and the saccharine worts of the brewer and distiller were then detailed; the supposed important part that this substance plays in the animal œconomy, in the formation of fat, briefly noticed; as also the conversion of this body into sugar during germination, thus supplying valuable food to the young plant as it was required.

The whole of this interesting demonstration, replete with useful and valuable information, was illustrated by a series of accurate botanical and microscopic sketches of the various kinds of starch and some of the plants from which they are derived, for which, and also many interesting preparations, the Professor stated that he was indebted to the kindness of Dr. Pereira.

The microscopic configurations of the various kinds of this substance, with their beautiful appearance when viewed by polarized light, were exhibited in the library by Mr. Ross at the close of the lecture.

Friday, Feb. 3, 1843.

Mr. E. Solly, Jun., on "Smoke and its Consumption."—This subject, so important to every manufacturer and inhabitant of this smoky metropolis, and indeed we may say of the United Kingdom in general, was treated in a very clear and instructive manner on the above evening. Mr. Solly apologized for beginning his lecture on the most elementary principles of combustion, but from many in the assembly being unacquainted with the scientific groundwork of the subject, this was imperative.

The elementary constituents of the combustible bodies in general use were fully detailed, and the principles on which these elements burnt or were oxidized explained and well illustrated: the necessary adjuncts to their perfect oxidation, so as to prevent any deposition of their carbon in the form of soot or smoke, shown by various experiments; and ultimately the numerous methods that have been invented or proposed by different individuals within the last twenty years, discussed and exhibited by a series of coloured sectional sketches, arranged so as to divide the inventions into the distinct principles on which they were founded, as, for instance,—1st, those where the combustion was effected by a downward current of the smoke, through the red and glowing body of fuel; 2nd, in which a current of air was made, to enter over the surface of the burning fuel; 3rd, where a current of air was made to meet the smoky products of the combustion at the extremity of the fuel or bridge; 4th, the cases in which air previously heated was admitted in the same way and for the same purpose, avoiding the cooling attendant on the previous method; 5th, where the unconsumed carbon, &c. was made to traverse a considerable length or a second chamber of clear burning fuel; and 6thly, in which the whole of the bars of the furnace which support the fuel were made to move gradually from the point at which the fresh fuel was being delivered. The lecture was illustrated by some good experiments, some of which we cannot



help noticing. The proof that the interior of all flame is gaseous was shown by two glass tubes, open at their extremities, and placed in the form of the letter V with the angle in the interior of a large flame, the gaseous matter generated by the high temperature on the surface of the wick was conducted up these tubes and ignited at the other extremity. Very finely divided charcoal was ignited, and then thrown into a jar of oxygen gas, producing an appearance resembling a large flame, as an evidence that it was the fine state of division of the carbon that caused flame; and the apparent combustion of a stream of oxygen when jetted into a jar of carburetted hydrogen gas in combustion, to show that the inflammable gas burnt around the jet of oxygen. An interesting analysis of house-dust and blacks was also given in illustration of unconsumed carbon floating in the air.

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### PATENTS.

*Patent granted to James Shanks, St. Helen's, Lancashire, Chemist, for Improvements in the Manufacture of Carbonate of Soda.*

THESE improvements consist in two methods of operating on the black ash or carbonate of soda of commerce, for the purpose of converting the caustic soda and silicate of soda therein contained into carbonate of soda; and likewise, when crystals are to be made, increasing the quantity produced from the soda liquor.

The first method consists in breaking the masses of black ash into pieces about an inch square, and placing them in layers three or four inches deep, in a stone or iron vessel called a carbonator, furnished with a pipe at each end for the entrance and exit of the gases hereafter mentioned. The layers are moistened with water, and then a stream of carbonic acid gas is passed through the carbonator until the whole of the soda is carbonated, which may be known by the escape of sulphuretted hydrogen. The black ash is then removed to the vats, and treated in the ordinary way.

In the second method, the black ash is made into a lye, and then subjected to the action of carbonic acid gas. The carbonator used in this process is 10 feet high, and of such an extent as to afford 16 cubic feet of space for every ton of soda ash, and 6 cubic feet for every ton of crystals to be made per diem. Across the bottom of the carbonator an arch of open brick-work is thrown, and the space above it is filled with small pebbles about the size of a cubic inch. The carbonic acid gas is introduced below the arch, and, ascending among the pebbles, meets the soda liquor, which is pumped in at the top of the carbonator from the vats that contain it. When this liquor is perfectly carbonated, it will lose its greenish yellow colour and assume a transparent appearance.

The patentee varies this process, by taking the last or weakest soda liquor from the vats, and surcharging it with carbonic acid gas, by passing it through the carbonator; it is then used for lixiviating the fresh charges of black ash in the vats.

The patentee claims as his invention the methods, above described, of operating upon black ash as commonly prepared by manufac-



turers, or the solutions made therefrom, and converting the caustic soda and the silicate of soda therein contained into carbonate of soda.—Sealed May 27, 1841.

*Patent granted to Anthony Todd Thomson, M.D., of Hinde Street, Manchester Square, for an improved Method of manufacturing Calomel and Corrosive Sublimate.*

This invention consists in combining chlorine in the state of gas with the vapour of mercury or quicksilver, in order to produce calomel and corrosive sublimate.

The apparatus employed consists of a glass, earthenware, or other suitable vessel, mounted in brick-work, and communicating at one end with a large air-tight chamber, and at the other end, by means of a bent tube, with an alembic, such as is generally used for generating chlorine gas. The alembic is charged with a mixture of common salt, binoxide of manganese and sulphuric acid, or of bin-oxide of manganese and muriatic acid, in order to produce chlorine gas.

The mode of operating with this apparatus is as follows:—A quantity of mercury or quicksilver is placed in the glass vessel, and the temperature of the same is raised to between  $350^{\circ}$  and  $660^{\circ}$  Fahr., by means of an open fire beneath. The chlorine gas, as it is generated, passes from the alembic through the bent tube into the glass vessel, and there combining with the vapour of the mercury, forms either corrosive sublimate or calomel according to the quantity of chlorine gas employed.

The product is found at the bottom of the air-tight chamber, and may be removed from the same through a door, when the operation is finished.

*Claim.*—The direct combination of the gas called chlorine with the metal called mercury or quicksilver, either in a state of vapour or otherwise, so as to form the compounds called corrosive sublimate and calomel, according to the proportions in which the vapours and materials are combined.—Sealed Sept. 11, 1841.

## PRICE CURRENT OF CHEMICALS.

It having been intimated to us from several quarters that a price current of the various chemicals and drugs would be very useful to many of the readers of this Journal, we have endeavoured, with the assistance of some friends, to draw up the following list. In a subsequent Number we hope to be able to give a list of the prices of drugs both in the London market, and also in those of Hamburg and other continental staple places:—

	s.	d.	s.	d.		s.	d.	s.	d.
Acetate, Lime, per cwt.	22	0			Acid, Muriatic, per lb.	0	1		
Soda, per cwt. ....	36	0			Nitric, per lb. ....	0	7		
Acid, Acetic, 50%, per lb.	0	6½			Nitrous, per lb. ....	0	6		
Common, per gall....	4	6			Oxalic, per lb. ....	1	4		
Citric, per lb.....	2	3			Sulphuric, per lb. ...	0	1¼		



	s.	d.	s.	d.		s.	d.	s.	d.
Acid, Tartaric, pulv.,					Orchil, Paste, per cwt.	45	0		
per lb.....	1	4			Cape, per cwt. ....	40	0		
„ crist., per lb.	1	3			Pearlashes, 1st, per cwt.	31	0		
Alkali, 35%, per cwt....	8	0			2nd, per cwt.....	30	0		
42%, per cwt. ....	11	0			Pot ashes, 1st, per cwt.	31	0		
48 to 52%, per cwt.	14	6			2nd, per cwt.....	30	0		
Alum, lump, per cwt....	11	0			Potash, bichromate, per				
Ground, per cwt. ...	12	0			lb. ....	0	10		
Ammonia, Carb., per lb.	0	6			Chlorate, per lb. ...	2	9		
Liquor 980, per lb....	0	3			Hydriod., per oz. ...	0	10		
„ 960, per lb....	0	6			Muriate, per cwt. ...	16	0		
„ 880, per lb....	1	0			Prussiate, per lb. ...	2	0		
Muriate, per cwt. ...	22	0			Sulphate, per cwt....	14	0		
Sulphate, per cwt....	19	0			Sal-ammoniac, per cwt.	48	0		
Annatto, Cake, per lb..	2	0			Salt, Cake, per cwt....	3	0		
Spanish, per lb.....	2	3			Petre, per cwt. ....	25	0 to 28	0	
Antim., Tart., per lb....	1	8			„ British refined,				
Arsenic, White, pulv.					per cwt. ....	32	0		
per cwt. ....	14	0			Sorrel, per lb. ....	1	9		
White, lump, per cwt.	20	0			Salts, Epsom, per cwt.	12	9		
Black Lead, in bulk,					Glauber, per cwt. ...	7	0		
per cwt. ....	15	0 to 20	0		Rochelle, pulv., per				
Packeted, per cwt....	22	0 to 33	0		cwt. ....	84	0		
Bleaching powder, per lb.	0	2 $\frac{1}{4}$			„ cryst. per cwt.	80	0		
Borax, per cwt. ....	65	0			Smalts, per lb. ....	1	0 to 2	6	
Brimstone, Roll, per cwt.	10	6			Soda, Crystals, per cwt.	8	6		
Calomel, per lb.....	5	0			Carbonate, per cwt... 30	0			
Castor Oil, per lb.....	0	7 to 0	11		Spirits, Lac, per lb. ...	0	2 to 0	4	
In quarts, per dozen	15	0 to 18	0		Peach, per lb. ....	0	5		
Copperas, Green, per					Plum, per lb.....	0	5		
cwt. ....	6	0			Scarlet, per lb. ....	0	5		
White (foreign), per					Turpentine, per cwt.	35	0		
cwt. ....	16	0			Sugar of lead, No. 1,				
Cornwall clay, per ton	80	0			per cwt. ....	48	0		
Corrosive subl., per lb.	3	11			No. 2, per cwt. ....	45	0		
Cudbear, per lb.....	0	10 to 1	6		Gray, per cwt. ....	35	0		
French chalk, pulv., per					Brown, per cwt. ...	30	0		
cwt. ....	38	0			Sulphate, Barytes, per				
Cut, White, per cwt.	56	0			cwt. ....	4	0 to 5	6	
Galls, Blue, per cwt....	70	0 to 80	0		Copper, per cwt. ...	39	0		
Sorts, per cwt. ....	65	0 to 75	0		Venetian red, pulv., per				
Iodine, per oz. ....	0	4 $\frac{1}{2}$			cwt. ....	8	6		
Ivory black, per cwt....	9	0			Verdigris, French, per				
Lamp black, in bags,					cwt. ....	1	6		
per cwt. ....	12	0			English, per cwt. ...	1	3		
Packeted, per cwt... 18	0				Brunswick green, per				
Litharge, W.B., per cwt.	22	0			cwt. ....	16	0 to 35	0	
Welch, per cwt.....	21	0			Emerald, No. 1, per lb.	1	2		
Pulv., per cwt. ....	23	0			No. 2, per lb.....	1	0		
Magnesia, Calc., per lb.	1	10			No. 3, per lb.....	0	10		
Carbonate, per cwt... 80	0				Orange lead, per cwt... 29	0			
Manganese, per cwt....	11	0			Red ditto, per cwt. ... 19	0			
Muriate, Lime, per cwt.	5	0			White ditto, per cwt... 19	0			
Tin, per lb. ....	0	6			Prussian blue, per cwt.	1	9 to 2	3	
Musk, American, per oz.	8	6			Lead, Pig, American,				
Naphtha, per gallon ...	9	0			per cwt. ....	17	0		
India Rubber, per					Chrome ore, per cwt... 12	0			
gallon.....	4	6							



# THE CHEMICAL GAZETTE.

No. IX.—March 1, 1843.

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## PHARMACEUTICAL SOCIETY AND MEDICAL REFORM.

THERE is an opinion current amongst all classes of men at the present day, that the abuses which characterized the institutions of our forefathers, whether surviving or extinct, being revealed to us in all their grossness by the lapse of time and in the light of free discussion, are now abjured and conscientiously excluded from those recently framed; that, in short, corrupt motives and private interests by no means enter into enterprises now undertaken with the pretext of public good, inasmuch as the purifying influence of open discussion and free inquiry would be at once felt, acknowledged, and submitted to. There cannot be a greater fallacy; and a glance at what is now transacting in any branch of the medical profession will serve at once to display it. A vigorous, and, it must be added, an *unscrupulous* press, has accomplished, by strange means, an immense amount of good, has demolished many crying abuses in the administration of the few weak and inefficient laws which medicine has enjoyed, diverted into public channels countless streams which flowed into and enriched private,—nepotism at hospitals, and close corporations,—and has raised the standard of the profession, if not to a level, yet within a visible distance of its exaltation in foreign countries. Under this fallacious assurance of an efficient surveillance the public reposes in fancied security; yet we believe we may venture to say, that at no former time was it so easily, and by such simple means, imposed upon—empiricism in all shapes, disguised and open, flourishes to an unparalleled extent; and the more it is assailed by reason and shaken by such assaults, like the oak in the storm, the more deeply and securely does it strike root and bear fruit. We make these remarks in especial reference to the practices and pretences of the *Pharmaceutical Society*. The Apothecaries' Company was invested by Parliament in the year 1815 with the privilege of licensing all persons in England and Wales who should practise physic, and of receiving a payment for such license, which confers upon the receivers important legal advantages. That Company has certainly done much good: it has exalted the character of the pro-



fession, and in doing this has given origin to the present numerous and useful body, the retail chemists and druggists. Great objections have been made to investing the apothecaries with this important function; it has been supposed to be rather applicable to the promotion of private interests. We cannot discuss this here; we merely allude to it in order to observe, that the Pharmaceutical Society, which at its institution was supposed to be for the promotion of a knowledge of pharmacy, for raising the standard of education, and which might have effected much good, has become vitiated by being diverted chiefly to the advancement of private interests. It has, moreover, laid itself open to still more grave objections. A vague apprehension has been raised, and studiously promoted, that privileges similar to those of the Apothecaries' Company would at once be conferred upon the Pharmaceutical Society by Parliament, and that all persons who had not enrolled their names and paid their fees as members of this Society, would be henceforth excluded from the power of carrying on the business of a chemist and druggist, or, at least, would be subjected to the expense of pursuing a prescribed course of study and undergoing a rigorous examination,—*and an examination by whom?* Under this feeling, the number of members and associates who sought an entrance into the Society was altogether unexampled in the history of societies. By dexterously playing upon this apprehension, limiting the period at which admission would be possible without a searching examination, and boldly avouching the certainty of Parliament's granting these extraordinary powers to a self-constituted body, subscriptions flowed in from masters, assistants and apprentices; but now that the second year's contribution has become due, the members are eagerly asking, for what are they called upon to pay? Two guineas annually is no slight burthen, and this too when the Apothecaries' Company, authorized as it is by law, charges only six guineas at one payment for its certificate.

To our country friends we therefore say, unhesitatingly, you will never receive any equivalent for your money. The Society has not, and probably never will have, any legal privileges. It may make great efforts to obtain them, especially if you continue to supply the necessary funds; but be assured, that should it succeed, it will be most injurious to the chemist and druggist. Is it possible for the legislature to incorporate the Pharmaceutical Society, or any other body, to examine and license the trader in drugs and chemicals, without enacting a very stringent prevention to all counter practice? Is it likely, that while to the physician, surgeon, and apothecary extensive and expensive courses of study are enjoined, you will be permitted to prescribe, having only the license of chemist and druggist? No! not a dose of rhubarb or a black draught! You will be infallibly restricted, under heavy penalties, from recommending or directing the application of a single article in your shops, as a set-off against the privileges granted to you as a corporate body. Is the Council of the Pharmaceutical Society not aware of this? Look at the list of these gentlemen;



and if they are not, and are really innocently drawing their subscribers into the odd position of giving their money to purchase a law which shall deprive them of half their income, one thing is certain, viz. that most of *them* are in such business as to be unaffected themselves by such a law. Most of them are independent of counter practice. In our humble opinion, the only course to be pursued to avert this is for every member who is interested in the matter at once to withdraw his name; for should an act pass in favour of any class, all persons at present in business would certainly be excluded from its operation, as was the case with the Apothecaries' Act in 1815. It is more than probable that the Royal College of Physicians will be authorised by the promised law relating to the profession, to examine and license all persons seeking to become chemists and druggists.

To members of the Pharmaceutical Society whose interests are not touched by this difficulty, we say we are not hostile to the continuance of that Society, but, on the contrary, favourable to it, upon the footing and with the pretensions of other societies, which seek by co-operation to advance some branch of knowledge. In this point of view it might render itself worthy of support, but it cannot be supposed for a moment, that if this were its object, it would proceed in its present course. We have alluded to personal and private interests mainly secured by the Society and the application of its immense funds; there is much to be explained in reference to this point, to which we shall return in our next number.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*Action of Nitric Acid on Starch—Xyloidine.* By M. BUIJS BALLOT.

PELOUZE has published some experiments on xyloidine, which had been discovered by Braconnot when acting with nitric acid on starch and on woody fibre. Pelouze prepared it by mixing starch intimately with nitric acid of 1.5 spec. grav., and precipitating immediately with water, when scarcely anything remained in solution. But when starch is left in a closed vessel in contact with nitric acid without water, the whole is found to be decomposed in a couple of days, or sometimes even after a few hours; xyloidine has disappeared, and in its stead is found a deliquescent acid, which on evaporation forms a white, solid and non-crystalline mass, and amounts to much more in weight than the starch which had been employed. Neither carbonic acid nor oxalic acid are formed.

Pelouze regards xyloidine as starch in which 1 equivalent of nitric acid has taken the place of 1 equivalent of water, which would explain why the starch, in its decomposition by nitric acid, had increased in weight.

When starch is boiled with nitric acid, and then evaporated in the water-bath, a deliquescent non-azotized acid is obtained, ac-



according to Pelouze, which has much similarity with saccharic acid, although differing in composition.

The xyloidine with which the following analyses were made, was prepared by mixing intimately and quickly potatoe starch gradually with fuming nitric acid in a glass mortar. When the granules have disappeared, and the whole forms a transparent gelatine, it is mixed with water, and affords a white, coarse, granular precipitate.

Xyloidine, of a first preparation, gave, as mean of two analyses, 37.51 per cent. carbon and 4.95 hydrogen; of a second preparation, 36.58 per cent. carbon and 4.70 hydrogen; and of a third preparation, 36.95 per cent. carbon and 4.73 hydrogen, which correspond with the results of the second.

But xyloidine, prepared in the above manner, contains two (if not more) distinct substances, which are easily distinguished; for when treated with a dilute solution of caustic potash, a portion dissolves in it, while another is not dissolved in a large quantity of potash, even after two days; this undissolved portion was white and pulverulent after careful washing. It would seem therefore that there are two modifications of xyloidine, one soluble entirely in potash, the other not at all.

The undissolved portion gave, on analysis, 37.24 carbon, 4.65 hydrogen; and that of a second preparation 36.45 carbon, 4.42 hydrogen, in which the atomic proportion of carbon to hydrogen is as 12 to 9.

The slightly brown-coloured alkaline solution was thrown down with acetic acid, and the white flocculent precipitate collected on a filter and washed with acetic acid. The analysis of this body gave 38.01 carbon and 4.94 hydrogen. In this case the atomic relation between carbon and hydrogen is likewise as 12 to 9.

At all events, it is evident that the substance which Pelouze calls xyloidine consists of more than one body, nor do any of the above analyses agree with the formula adopted by him,  $C^{12}H^9O^9 + NO^5$ , which requires, in 100 parts, 35.19 carbon, 4.30 hydrogen, 6.79 nitrogen, and 55.72 oxygen.

A quantity of xyloidine was extracted with alcohol, what remained undissolved again treated with alcohol, and dried at  $248^\circ$  Fahr. On analysis it afforded 5.70 nitrogen, 36.80 carbon, 4.85 hydrogen, which gives the following formula:—

	Atoms.	Calculated.	Found.
Carbon . . . . .	15	37.31	36.80
Hydrogen . . . . .	12	4.84	4.85
Nitrogen . . . . .	1	5.76	5.70
Oxygen . . . . .	16	52.09	52.65
$4(C^{15}H^{12}NO^{16}) = 5(C^{12}H^{10}O^{10}) - 2HO + 4NO^4.$			

No gas escapes on mixing starch with the fuming acid, not even when water is added; the aqueous liquid affords, after filtration, evaporation and saturation with ammonia, on the addition of lime salts, no precipitate. 4.612 of starch, dried at  $212^\circ$  Fahr., were converted into xyloidine by means of fuming nitric acid, well edulcorated with water, and dried at  $212^\circ$ ; it then weighed 4.800,



whence it is evident that starch, in its conversion into xyloidine, does actually increase in weight.—*Ann. der Chem. und Pharm.* for Jan. 1843.

*Prussic Acid from Essential Oils and Resins.*

According to Sobrero, when oil of turpentine, oil of lemons, of beech, lavender, bergamot, juniper, cloves, of camomile,—pine resin, mastic, copal, galbanum, &c., are treated with dilute nitric acid, perceptible quantities of prussic acid are formed, varying with the ease with which oxidation takes place. The prussic acid is given off when the oil has become thick and the acid coloured.—*Journ. de Pharm.*, 1842, p. 207.

*On the Conversion of Valerian Oil into Borneo Camphor and Laurel Camphor. By M. GERHARDT.*

In a former Number we gave an account of the conversion of valerian oil and the oil of salvia into camphor by the action of nitric acid, and we then briefly noticed that M. Gerhardt had obtained the same product by acting on valerian oil with potash. We now proceed to give an account of his experiments. This oil, as there stated, is a mixture of at least two; the less volatile is termed Valerol, and is composed of  $C^{12}H^{20}O^2$ ; in its pure state it has not the unpleasant smell of valerian, but by long exposure to the air it is converted into valerianic acid. Some degrees above  $32^{\circ}$  Fahr. it solidifies into colourless transparent prisms, which may be preserved unaltered in closed vessels. Whether in the state of oil or crystallized, valerol was always found to have the same composition. When treated with fused potash, it is converted into valerianic acid with evolution of hydrogen; and when a mineral acid is added to this mass carbonic acid is disengaged, and the valerianic acid rendered free. It would seem therefore that valerianic acid is not a product of vegetation, but is derived from the action of the atmosphere on the essential oil secreted by the plant.

Like nearly all other essential oils containing oxygen, the valerol is accompanied in the oil derived from the valerian root by a carburetted hydrogen having the composition of the oil of turpentine; it boils at the same temperature, and has, in common with it, the peculiarity of affording a crystallized compound when treated with hydrochloric acid gas.

This carburetted hydrogen is less subject to change than valerol. When kept for 14 days over mercury in dry oxygen gas, it did not become resinous, and appeared not to alter in the least; but when brought into contact with moisture, and especially when distilled several times with a solution of potash, it takes up the elements of 2 atoms of water, and is converted into a crystalline camphor, which has all the properties of the solid Borneo camphor (from *Dryobalanops camphora*), and has the same composition, viz.  $C^{20}H^{36}O^2$ . For this reason the author applies to the carburetted hydrogen of the



valerian oil the name of Bornéen, and to the camphor that of Borneol. He is inclined to believe the bornéen to be identical with the liquid camphor, as it has all its properties, even the turpentine-smell; but he could not obtain the product of oxidation  $C^{20}H^{32}O^4$ , which, according to Pelouze, is formed when the liquid Borneo camphor is preserved in badly closed vessels, but which was probably nothing more than moist borneol. A proof of the identity of borneol and the camphor of Pelouze is, that both are converted by nitric acid into laurel camphor (from *Laurus camphora*),  $C^{20}H^{32}O^2$ . The reaction is accompanied by the same appearances. Bornéen, heated with nitric acid, then saturated with carbonate of soda and distilled, affords laurel camphor.

Moist and old valerian oil always contains a certain quantity of borneol, which may be detected by rectifying the oil over potash. The bornéen which is then obtained in the product, is contaminated with camphor, from which it must be freed, previous to analysis, by repeated rectification. Bornéen containing this camphor always leaves, when evaporated on a glass plate, a crystalline residue.—*Comptes Rendus*, Sept. 1, 1842, p. 832.

*Cases and Reflections on the Employment of the Ioduret of Potassium in the Treatment of Acute Rheumatism.* By Dr. AUBRUN.

Many papers have been written and published in the *Gaz. Méd. de Paris* by various physicians on this subject. By some it has been highly recommended, while by others again it has been condemned as not only being productive of no benefit but of harm. These contradictory reports, Dr. Aubrun thinks, are owing to its combination with iodine in the metallic state, the form in which it is generally ordered. The dose that Dr. Aubrun has been in the habit of giving is 1 to 6 grammes in the day. He has employed it in acute, sub-acute and chronic cases, and in them all he has found it of great service. In the paper before us he has reported four cases of acute rheumatism, in some of which no other remedy was had recourse to, while in others bleeding and opium were previously employed without any alleviation of the pain. As there is nothing very remarkable in the cases themselves, we shall content ourselves with merely inserting the conclusions at which the author arrives.

1. The ioduret of potassium is of great use in the treatment of acute rheumatism.

2. In feeble subjects it may be trusted to alone, without any previous bleeding; but in plethoric patients it is better to begin the treatment with 1 or 2 large venesections, and not to employ the ioduret until towards the end of the second week.

3. The patients treated in this way are less liable to suffer from rigidity of the muscles and swelling of the joints—a pretty frequent occurrence in this disease, and the removal of which is so difficult.

4. The dose varies according to each individual. In general 1 or 2 grammes daily are well supported, but if there is no contra-indication it may be carried to the length of 6 or 8 a-day.



5. Dr. Aubrun chiefly employed it on men, and has never observed that their testicles either diminished in size or became impaired in function.

6. The bad consequences which may be said to result from its employment are,—1, slight salivation; 2, a sensation of bitterness in the mouth, always observed, and of which the patients complain much; 3, a greater or less feeling of heat in the mouth, with redness and pain of the throat; the tonsils continuing of a natural size when a large dose has been administered; 4, slight inflammation of the conjunctiva and pituitary membrane. Dr. Aubrun has seen this twice.

7. Its action is hyposthenic and resolute, and it is better supported, and is more active, according as the patients have a feeble constitution or have been previously bled.—*Gazette Méd. de Paris*, Dec. 10, 1842, as abridged in the *Lond. and Edinb. Med. Journ.* for Feb. 1843.

#### *Fusel Oil from Beet-roots.*

On the fermentation of beet-root molasses a fusel oil is evolved, which, according to Gualtier de Claubry, is, when pure, identical with the fusel oil obtained from potatoes. The crude oil obtained from the alcohol of the beet-root molasses has a penetrating smell and an acrid taste. When purified it is composed of  $C^{10}H^{12}O^2$ , just as potatoe fusel oil.

When crude potatoe fusel oil is acted on with sulphuric acid, it affords four substances:—1. A fluid soluble in sulphuric acid, which boils at  $205^{\circ}$  Fahr., is colourless, bitter, and has a very penetrating smell; its composition is expressed by  $C^{10}H^{11}O^2$  (amyle-aldehyde). 2. A fluid soluble in sulphuric acid with a red colour, boils at  $338^{\circ}$ , is void of colour and taste, and of a very agreeable odour; it is composed of  $C^{10}H^{11}O$  (æther of the amyle series). 3. A fluid insoluble in sulphuric acid, which boils at  $280^{\circ}$  Fahr., and has a pleasant odour; its formula is  $C^{10}H^{10}$  (amyle). And, lastly, a very small quantity of a fluid with a strong taste and smell of æther, which was found to be composed of  $C^{10}H^{11}O^2$ , but is probably only a mixture of amyle with some other compound.—*Comptes Rendus*, xv. p. 171.

#### *On the Tin Ground of Mergui.*

The 'Journal of the Asiatic Society of Bengal,' Nos. 37 and 40, for 1842, contains a report of Captain Tremenheere, Superintendent of Forests, relative to the discovery of tin ores in the province of Tenasserim. The following short extract, showing the extent of the occurrence, and the ease with which it may be obtained, may prove acceptable to some of our readers.

Of the existence of tin in considerable quantities in the province of Mergui there cannot be much question; and from the trial of the produce of one man's labour in a given time, there appears to be sufficient to justify every expectation of a profitable employment of labour on an extensive scale.



The places at which the trials were made, were not selected as the best from previous information, but were arrived at more by accident than design, and the stanniferous gravel and sand collected where the bed was tolerably level, stream slack, and where the greatest deposit appeared to have recently occurred.

No part of the bed of the Thabawlick, which was examined, was found wholly destitute of tin; and it is reasonable to conclude that the ore exists in numerous spots, especially in the vicinity of the hills from which the streams arise, in far greater abundance.

The results, therefore, can only be considered rough approximations to the quantity of tin these streams would afford, and to the probable amount with an establishment properly superintended. The quantity obtainable would fully repay the employment of men in this operation.

The tin, as produced by the washers, should be placed on sloping boards, and water conducted over it from a trough pierced with holes for the purpose, in order to get rid of foreign particles; and it would then, after being finely pounded, be ready for smelting. Of all metals tin is, in this process, the least troublesome, after the ore is freed from the earthy and siliceous particles with which in other countries it is often mixed.

The crystallized form, in which it here occurs, renders its separation extremely easy, and the whole processes of stamping and dressing, which in England are tedious and expensive, can thus be dispensed with. No arsenic or sulphur being mixed with the ore, it need not be roasted before it is placed in the smelting furnace.

It would thus appear that the tin of the Mergui province offers no ordinary inducement to the outlay of capital, without much of the risk, uncertainty, and large previous disbursements usually attending mining adventures.

#### *On the Presence of Theine in the Leaves of Ilex Paraguayensis.*

Recent chemical researches have proved that the bitter tonic substance called *Theine*, found in the leaves of tea, is identical with *Caffeine*, obtained from the seeds of coffee. On this subject Liebig remarks—"We shall never, certainly, be able to discover how men were led to the use of the hot infusion of the leaves of a certain shrub (tea), or of a decoction of certain roasted seeds (coffee). Some cause there must be, which would explain how the practice has become a necessary of life to whole nations. But it is surely still more remarkable that the beneficial effects of both plants on the health must be ascribed to one and the same substance, the presence of which in two vegetables, belonging to different natural families and the produce of different quarters of the globe, could hardly have presented itself to the boldest imagination."

It is curious to remark, that a beverage called Guarana, used by the people on the banks of the Amazon, and in all probability procured from the leaves of *Paullinia sorbilis*, should yield a crystalline matter also identical with Theine, and that Theobromine, or the principle



yielded by chocolate, should be in many respects analogous. Mr. John Stenhouse of Glasgow has recently detected Theine in the leaves of the *Ilex paraguayensis*, Yerba Maté, or Paraguay Tea, which is the common beverage of a large portion of the inhabitants of South America.

This is a fact of great interest, when taken in connexion with the previous discoveries above alluded to, as tending to show that the same principle is found in many of those substances which are employed by mankind in different parts of the world to furnish a tonic and refreshing beverage. Theine is procured easily according to Mr. Stenhouse, by making an infusion of tea, precipitating by acetate of lead, filtering, evaporating the clear solution to a thickish consistence, and then subliming (?) from a sand-bath. In this way he has been able to procure  $1\frac{1}{3}$  per cent. from Assam tea without the use of alcohol or æther. The best test for Theine is ammonia, which, when added and heated to dryness, gives a beautiful rose-colour precisely similar to murexide. From the facility with which Theine is obtained and its tonic qualities, it is probable that it may be ere long used medicinally as a substitute for quinine and other remedial agents of a similar nature.—*Annals of Nat. Hist.* for March 1843.

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## ANALYTICAL CHEMISTRY.

### *Method of Analysis in Cases of Poisoning with Muriatic Acid.*

By M. ORFILA.

LONG since Orfila asserted that, in order to prove the presence of free muriatic acid in the contents of the stomach or intestines, or in organic liquids suspected to contain this acid, it was necessary to submit them to distillation. M. Devergie has recently stated that the muriatic acid is tenaciously retained by the organic substances, and cannot be demonstrated by distillation otherwise than by heating the residue completely to ash, which may easily lead to deceptions, arising from the chlorides contained, either normally or accidentally, in the contents. Bergouhnioux agrees with Devergie, and advises the addition of sulphuric acid previous to distillation, to facilitate the liberation of the muriatic acid. From these statements Orfila has been induced to institute a long series of experiments on the subject, and he finds that the assertions of Devergie and Bergouhnioux are correct when distillation is not carried further than to the consistence of a syrup; the animal substances do *not* allow of the muriatic acid escaping at that temperature; with vegetable substances it is not the case to the same extent. But a portion of the muriatic acid is liberated even from animal substances and mixtures, when the distillation is carried on at a gentle heat until the residue is perfectly dry. More muriatic acid, it is true, is given off when the residue is carbonified; but then the empyreumatic products of decomposition, which react on salts of silver, render the reaction of the distilled liquid doubtful. In case sal-ammoniac, or any other volatile chloride, should be present, they also pass over under the



above circumstances, but they do not impart to the fluid any acid reaction, which must also exist together with the action of solution of silver, if the presence of muriatic acid is to be admitted. The use of sulphuric acid must be discarded, as the chlorine present in the chloride may be converted by its agency into muriatic acid. The liberation of the muriatic acid is however very much facilitated if the liquid under examination is previously treated with alcohol or precipitated with tannin. Orfila advises accordingly the following method of analysis in cases of poisoning with muriatic acid :—

All the fluid contents of the intestines, and whatever may have been voided by vomitings or perforations, are collected, then tested as to their possessing an acid reaction, in which case they are placed aside. The solid contents, as also the œsophagus, and the intestines (which are cut into pieces), are boiled in a retort with distilled water for 5 or 6 hours, the evaporated water being constantly replaced, and what distils over collected in a receiver and placed aside. The product contains in general no muriatic acid. The decoct is now added to the above-mentioned liquid substances, and the whole precipitated with a concentrated solution of galls until no opalescence appears ; then left to subside, and the tolerably clear reddish yellow liquid conveyed into a large retort, the recipient of which should be kept very cold, and distillation carried on at 212° Fahr. The first nineteen-twentieths of the product are in general perfectly free from muriatic acid, although they sometimes possess a faintly acid reaction. They are placed aside, and distillation now carried on to near dryness, but with great care. The product thus obtained decidedly contains muriatic acid, if any were present. The precipitate with nitrate of silver often increases if the product be boiled for some time with nitric acid, which at the same time redissolves any silver that may have been reduced by the organic substances. It cannot however be denied, that even in the case where the product of distillation has an *acid reaction* and affords chloride of silver, the presence of free muriatic acid is, it is true, very probable, but not entirely certain, since the acid reaction may arise from some other free acid, and the chloride of silver from volatile neutral chlorides. And even with a decidedly acid reaction, it is only possible to conclude, as to poisoning by muriatic acid, when the amount of precipitate is very considerable, combined with the anatomico-pathological results, and the appearances of disease previous to death, as the presence of free muriatic acid in the stomach, and sometimes to a considerable amount, has been most satisfactorily proved.—*Annal. d'Hygiène*, Oct. 1842.

*On the Qualitative and Quantitative Determination of Iodine in Cod Liver Oil.* By M. WACKENRODER.

In the examination of this substance, 1 or 2 ounces of the oil are warmed in a porcelain dish, with as much pure caustic potash or soda until the whole has formed a soap, which is heated till it has become dry and brittle, or even appears somewhat black. It is then



conveyed by degrees into a weakly heated platinum or porcelain crucible. When the soap is carbonified, the residue is exposed to a red heat for a time in the open crucible, in order to drive off any empyreuma which might remain in the coal and would disturb the experiment. It is then extracted with water, the clear liquid evaporated down to a small volume, and, after the addition of some carbonate of ammonia, to near dryness. The product will therefore be neutral, or in part sesquicarbonated alkali, from which the small quantity of the iodide of potassium or iodide of sodium mixed with it may easily be extracted by means of 3 or 4 times the quantity of alcohol of 0.852 sp. gr. in the cold, which is most easily effected when the salt is well shaken with the alcohol in a stoppered vessel, and the clear portion afterwards decanted. The alcohol leaves, on evaporation in a porcelain vessel, the iodide of potassium or iodide of sodium, generally mixed with some metallic chloride, or with carbonated alkali, which is tested in the usual way for iodine.

The amount of metallic iodide extracted was always found to vary with the quantity of cod liver oil which had been employed. On several occasions however only the half of the iodiferous residue from 18.0 grammes of oil were used to prove most satisfactorily the presence of iodine in it. The apparatus employed for this purpose is a reduction tube, 4 inches long and of the thickness of a swan's quill. About an inch from the open extremity it is drawn out to about the thickness of a knitting-needle, and is then broken off above obtusely. The dried salt, in which iodide of potassium or iodide of sodium is suspected, is brought into the tube, and a couple of drops of concentrated sulphuric acid then added. As the acid is retained for some time in the narrow portion, there is sufficient time to stop up the tube with a stiff paste of wheat-starch, which is preferable on account of its white colour, in such manner that the gas developed can only find an exit through the paste. If now the lower part of the tube is slightly warmed, for instance by the hand, some air passes through the sulphuric acid, and this flows down as soon as the tension of the inclosed air decreases. It is evident that even the smallest quantity of iodine produced must come in contact with the starch-paste at the upper end of the tube when the lower portion is slightly heated. But it is not even necessary to heat it, for if the tube is placed in a slanting position 24 hours, the lower portion of the amylum becomes of a deep blue colour, even though the quantity of iodine in the salt was extremely small. The blue colour remains unchanged for several days. The whole quantity of the iodine in the iodates, even though very small, may be reduced in the same manner. It is only requisite to heat the iodate with concentrated hydrochloric acid and a drop of mercury, or with concentrated sulphuric acid and a little powdered iron-beatings (magnetic oxide), in the reduction tube. The starch is rendered blue, although no vapours of iodine may be perceptible.

If the tube is longer than above stated, the gaseous iodine is condensed too soon, and does not easily reach the starch. In this case it is only necessary to convey into the tube a grain of carbonate of



potash or of chloride of potassium. The gases liberated from these substances convey the gaseous iodine to the starch, and so hasten the action. When the salt under examination is mixed with some manganese previous to its being brought into the tube, the reduction of the iodine ensues more rapidly; but it is weakened if at the same time any chloride be present, as for instance in the salt mass resulting from the burning of the cod liver soap, or even destroyed by the chlorine evolved at the same time. The starch only becomes coloured violet or transitorily blue, and the result is uncertain.

As often as I have had occasion to examine the light brown cod liver oil in the above-mentioned manner, iodine has been found in it. Hitherto I have only tested one kind of the white oil without finding any iodine in it; but a friend has informed me that he has found some white cod liver oils to contain much iodine.

The detection of iodine in cod liver oil is therefore very easy; not so however its quantitative determination, as long as saponification of the fat and carbonification of the soap are the only means of separating iodine from its combination with the fat. It is extremely troublesome to make the experiment with large quantities of the fat; and small quantities, on the other hand, contain so little iodine, that inconsiderable and unavoidable differences in weight exert great influence on the determination of the iodine. The author always employed 30 grammes of the cod liver oil.

The mode of proceeding is similar to that described above for the qualitative analysis. Every mixture of chloride of potassium or chloride of sodium is most carefully avoided, and only pure caustic potash, prepared from perfectly pure *sal tartari*, employed in the saponification of the fat. The alcoholic extract is evaporated to drive off the alcohol, mixed with water, and then treated with nitrate of silver. A small addition of nitric acid removes the slightest trace of carbonate of silver which had formed; and excess of ammonia the chloride of silver and bromide of silver, which might also have been derived from the chlorine and bromine of the fat. The faintly yellow or white precipitate of silver was collected on a filter, washed, dried and weighed. To avoid an error in the weighing, the filter was placed within one of the same weight: in this manner, from 30·0 grammes of light brown cod liver oil, 0·018 gramme iodide of silver was obtained, and from a similar quantity of another oil, 0·009, which in the first case gives 0·324 per cent., and in the second 0·162 per cent. iodine in 100 parts of the cod liver oil examined.—*Archiv der Pharm.*, xxiv.

## PHARMACOLOGY.

*On Rad. Ginseng from Chinese Sources*, by M. CALAU; with *Observations* by Dr. MEYER.

THE *Jinseng* (Schinseng, Ginschen) is derived from a species of *Panax*, which probably bears great resemblance to *Panax quinquefolius*, but is neither identical with this nor with the *Panax pseudo-Ginseng* (*Panax Schinseng*, Nees ab Esenb.); the name of



the root, and of the plant from which it comes, signifies, translated verbally, "*Human Powers*." The Ginschen is a perennial plant, which grows wild in Manschuria, on the chain of mountains Schanntau, in Dauria? Korea, and at some places in China, as for instance in the province Ssan-ssi, only on the northern side of the mountains, in moist places, where it attains the height of 2 or 3 feet. The root consists of a rhizoma, of from 2 to 4 inches in length, and about 1 in thickness. It has a thick neck, and resembles in some degree that of *Daucus Carota*, with circular greyish brown bands on its horizontal section. The stem is striped, without ramifications, and of a red colour near the root; the leaves, whose petioles are frequently united in fours, and sometimes even in sixes, surround the stem in a verticil, and form sheaths at the base, and are imparipinnate; the leaflets, of which five are situated on the leaf-stalk, are ovate, with lengthened apex, serrato-dentate at the margin, and with reticular veins of a pale green colour; the flower-stalk is long and green, the inflorescence is a simple umbel, the petioles of which are of a red colour and very thin; the calyx and corolla are red, monopetalous, and with five divisions\*. The segments of the former are acute, those of the latter round; the germ consists of two coherent small globules, with a long stipes and a scarcely perceptible stigma; the filaments are capillaceous, somewhat expanded at the base, and surmounted by small round anthers; the fruit is a capsule of a red colour, and contains two seeds of the size of a mustard grain.

The officinal part of the plant is the root; it varies with the country from which it has been collected; in Korea and in China it is white, wrinkled in a dried state, and covered externally with a pulverulent mass which resembles starch; in Manschuria and Dauria it is yellow, and resembles amber; when dried it is even and smooth. The Manschurian is said to be far more active than the Korean, and is therefore preferred to this, although on account of its scarcity it is considered worth its weight in gold. It has a sweetish taste†, and in its pulverized state a scarcely perceptible peculiar odour. In Manschuria, however, it is very rare that ginschen roots are dug up which have a thick round collum; those which have two thick fibres, and are again divided at the extremity into two fibres, giving to the whole a certain degree of resemblance to the human form, are called "*Gin-schen-gni*" (which, translated literally, signifies *man-like*), and are sent to the Chinese court, as they are the property of the emperor, and are only possessed by him and a few of the chief officers of state. As the Chinese believe in the superstition that in a house in which one of these roots is preserved eternal untroubled happiness always dwells, it is valued far more than money, and belongs, after the death of the father, to the oldest

\* The Chinese authority is here in error; the corolla is not monopetalous and with 5 divisions, but consists of 5 petals; nor is the fruit a capsule, but a berry.—*Meyer*.

† The root fibres of a most carefully dried and very beautifully preserved specimen of the Manschurian Schinseng, which I saw, are far from being without taste, but have a sharp aromatic peculiar taste.—*Meyer*.



and most worthy member of the family. The fresh excavated roots are very sensitive to wind, and even towards the external atmosphere, and as soon as they are exposed to their influences they immediately lose their medicinal virtues. The digging up and drying of them are therefore performed with the greatest care, the excavated root quickly packed in a hermetically closed case, carried home, and immediately dried on iron pans in a baking oven at a gentle heat. The Manschurian root is said to become transparent from this mode of drying.

On the Russian and Chinese frontiers, in the neighbourhood of Nertschinsk, and further towards the origin of the Amur, where this is formed by the junction of the rivers Schilka and Argun, the Mongols, according to recent accounts, are said to dig up the ginschen root, and to send it to China. If this be the case, it may be assumed, with some probability, that the ginschen will also be found to occur on the Russian frontiers \*. Should this be confirmed, it would be desirable that the Russians should also learn from the Mongols the mode of treating the ginschen root.

In China this root is administered with great advantage as a strengthening medicine in decline, in general debility, in fact in all diseases resulting from weakness of the body; the root is said, on the contrary, to be noxious in fevers and in inflammations, nay even to cause death. The Chinese physicians administer it in the form of a decoct, with other means at the same time, sometimes only with a broth made with the feet of young chickens or mutton. The Chinese maintain that patients who have not sufficient strength to leave their chamber, are able to walk from three to four wersts after one dose of ginschen, and that the life of a dying man may be prolonged five or six days by means of it.

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The Pharmaceutical Society in Lisbon communicates, in the second Number of the first Part of its Journal, 1836, the following formula, according to which the ginschen is employed in China, from the report of one of its members residing in Macao:—

R Rad. Ginseng, ʒjj.

Rad. Zingiber. rec., ʒj.

Aq. fontan. ℥vj.

coque lene igne in balneo mariæ per duas horas, tunc infunde

Cinnamomi acuti, ʒj.

col. d. s. To be taken thrice.—*Pharm. Cent. Blatt.*, Jan. 18, 1843.

\* Hitherto, as far as I am aware, the ginschen has nowhere been found within the Russian boundaries; and even near the Amur, as far as Albasin, the well-known and celebrated botanist Turtschaninow has sought for it in vain. The statement that this valuable plant has been found wild in Dahuria, is probably founded on a confusion with some other similar root, for instance of *Stellera Chamæjasme*, or of *Euphorbia Pallasii*.—*Meyer*.



*On Gamboge.* By P. BÜCHNER.

Gamboge has been examined by Braconnot, Jahn, and more recently by Christison, who compared several kinds by analysis as to the per-centage of the various constituents.

Gamboge is obtained from several plants, as *Garcinia gambogia*, Roxb., *Gambogia Gutta*, Linn., *Manstogana gambogia*, Gærtn., *Stalagmites gambogioides*, *Hypericum bacciferum*, and *cayense*, which for the greater part are peculiar to the East Indies, but especially to Siam and Ceylon. It occurs in commerce generally in small cakes or in cylindrical rolls; according to Christison, the two kinds from Siam and two kinds from Ceylon contain resin, gum, fecula, fibre and water. Those which come from Siam in rolls contain far more resin and gum than those in cakes; while those which occur in sticks in Ceylon contain less resin than those in cakes; both however have the same amount of gum. According to this statement the kind from Ceylon in cakes, and which contains 75·5 per cent. resin, is best adapted for technical purposes, as for instance painting.

Professor Liebig had the kindness, on his return from England, to place in my hands two kinds of gamboge, which he had obtained from Prof. Christison, in order to find out their per-centage composition. The one (I) was labelled "Finest Siamese Pipe Gamboge, from Singapore, from a sample which had never come into commerce."

In exterior appearance it seemed very pure, was of a brownish yellow colour, and when pulverized gave a bright yellow powder not dissimilar to chrome yellow; it had a shining fracture, and evidently showed that the greatest care and cleanliness had been employed in collecting the sap. The other (II) was labelled "Ceylon Gamboge, as it is collected and prepared by the natives for the Ceylon commerce." This kind is never met with in the European trade; it was light, porous, of a dirty gray yellow colour, with a conchoidal and faintly shining fracture, and seemed, from its appearance, to contain much impurity, which, as appear from the following analysis, was found to be the case.

	I.	II.
Fat acid soluble in æther . . . . .	79·794	78·841
Colouring matter soluble in alcohol and water ..	0·573	4·030
Gum . . . . .	19·519	12·595
Sediment . . . . .	0·114	4·534*

## CHEMICAL PREPARATIONS.

*On the Preparation and Composition of some Cyanides of Gold.*  
By M. HIMLY.

GOLD has a very great affinity for cyanogen: when solutions of chloride of gold and cyanide of potassium are brought together, a

\* This sediment consisted for the greater part of small dirty particles of wood, dust and grains of sand.



double cyanide of potassium and gold is immediately formed; when, on the contrary, the hydrate of the oxide of gold, or fulminating gold, is treated with a solution of cyanide of potassium, the double protocyanide of potassium and gold is formed with a considerable evolution of heat.

*Protocyanide of Gold* is obtained from the double protocyanide of potassium and gold. When the solution of this latter salt is warmed with muriatic acid, a yellow powder separates, and if the whole be evaporated to dryness, prussic acid escapes, and a residue, consisting of chloride of potassium and protochloride of gold, is obtained, which on being treated with water, avoiding the direct light of the sun, leaves behind pure protocyanide of gold. It forms a canary-yellow crystalline powder, consisting of thin laminæ (six-sided prisms), with a play of colours, without taste, insoluble in, and unalterable by, water, alcohol, æther, and the strongest acids. Solution of potash deprives it only at a boiling heat of a portion of the cyanogen, some gold being reduced, and gives rise to the formation of the protocyanide of potassium and gold. Sulphuretted hydrogen has no action upon it; sulphuret of ammonia affords a solution from which acids precipitate the sulphuret of gold. The protocyanide of gold is anhydrous; once dried it is no longer affected by light; at a faint red heat it decomposes into cyanogen and gold, and leaves behind 87.463 to 88.037 gold; the formula  $\text{Au Cy}$  requires 83.284.

*The Protoeyanide of Potassium and Gold* is best obtained by dissolving 7 parts gold in *aqua regia*, precipitating with excess of ammonia, washing the fulminating gold well, and then bringing it into a hot solution of 6 parts cyanide of potassium in water. The liquid is decolorized and ammonia disengaged. From the concentrated solution the double salt crystallizes on cooling in beautiful prisms. By further crystallization of the mother-ley only bad products are obtained, and it is therefore better to employ the ley in the preparation of the protocyanide of gold, by treating with hydrochloric acid as above described; from which, if desired, more of the double salt may be obtained by direct solution in cyanide of potassium. The double salt has the crystalline form of sulphur; it is colourless, permanent in the air, does not change at  $212^{\circ}$  Fahr., and has a sweetish, subsequently somewhat metallic taste; it dissolves in 7 parts cold, and in far less hot water, very slightly in alcohol, and not at all in æther. When perchloride of mercury is added to the aqueous solution, a pale yellow precipitate is thrown down, without any evolution of gas, which increases and becomes darker by boiling, it is protocyanide of gold; the solution contains chloride of potassium and percyanide of mercury. Nitrate of silver causes, in the solution of the double salt, a white caseous precipitate, which appears to be a double protocyanide of silver and gold; it dissolves only partially in ammonia, leaving behind a white residue, which quickly becomes black in the light. The double protocyanide of potassium and gold gave, in two analyses, 77.863 protocyanide of gold and 68.46 gold; further, 31.243 potash, which equals 23.476 cyanide.



of potassium. The formula  $\text{Au Cy} + \text{Ka Cy}$  requires 77.454 protocyanide of gold ( $= 68.4$  gold) and 22.546 cyanide of potassium.

*Protocyanide of Ammonium and Gold.*—When saturated solutions of protocyanide of potassium and gold and sulphate of ammonia are mixed together, and absolute alcohol then added, sulphate of potash and sulphate of ammonia are precipitated; the filtered solution leaves on evaporation protocyanide of ammonium and gold in crystalline crusts. The salt is colourless, has a strong metallic taste, is easily soluble in water and in alcohol, but not in æther; it contains no water, and is decomposed at from  $372^{\circ}$  to  $480^{\circ}$  into cyanide of ammonium and protocyanide of gold. On analysis it gave 73.64 per cent. gold; the formula  $\text{Au Cy} + \text{N H}^4 \text{Cy}$  requires 73.708.

The *Cyanide of Gold* is obtained by decomposing the double cyanide of potassium and gold, and indeed best by precipitating the solution of this double salt with nitrate of silver, edulcorating the cyanide of silver and gold, mixing with a little water, and adding hydrochloric acid, but not in sufficient quantity to decompose the whole. The application of heat would easily give rise to a reduction of the cyanide of gold into the protocyanide, which is perceptible from the yellow colouring. The filtered liquid is evaporated in vacuum over sulphuric acid and caustic lime; it forms a white crystalline mass, in which small quantities of other cyanides occur, but which, by solution in a little water or alcohol, filtration and evaporation, may be purified. The cyanide of gold is obtained in large colourless laminæ and prisms. It may also be obtained by decomposing the percyanide of potassium and gold by means of fluosilicic acid, slow evaporation, and extraction of the residue with absolute alcohol. It is easily soluble in water, alcohol and æther. When the solution is evaporated at a gentle heat, some protocyanide of gold is formed, and the mass becomes coloured yellow. It contains water of crystallization, and affords therefore, when decomposed by heat, first prussic acid, then cyanogen, and leaves behind a carburetted gold, which easily burns in the air to gold. At  $122^{\circ}$  it melts in its water of crystallization. Oxalic acid produces no reduction; protosulphate of iron, especially on boiling, yields a yellowish precipitate. Perchloride of mercury effects no change, but the proto-nitrate of mercury causes a separation of protocyanide of gold and percyanide of mercury, which also happens when boiled with oxide of mercury. According to an analysis it contains 59.885 gold; the formula  $\text{Au Cy}^3 + 6 \text{aq.}$  requires 59.895.

The *Percyanide of Potassium and Gold* is most easily obtained when 35 parts of gold are converted into chloride of gold, as neutral as possible, and the aqueous solution then conveyed gradually into a hot solution of 46 parts cyanide of potassium. The liquid becomes decolorized, and on the cooling of the concentrated solution the double salt separates in large prisms, which may be purified by recrystallization. The gold is easily obtained from the mother-ley, by treating the decoction with the pentasulphuret of potassium and dilute hydrochloric acid. The double salt forms large colourless prisms, which, on exposure to the air or in vacuum, become milk-



white, giving off their water of crystallization. When heated, the air being excluded, the protocyanide of potassium and gold is formed, with an evolution of cyanogen. It is very difficult to decompose the salt entirely without the admission of air. Perchloride of mercury causes no precipitate in the aqueous solution of the double salt; protonitrate of mercury a yellow one when boiled; nitrate of silver affords a caseous precipitate of cyanide of silver and gold, which becomes dark in the light, is insoluble in nitric acid, but soluble in ammonia. The double salt, dried at  $300^{\circ}$ , contains 11.47 potassium and 57.177 gold. The formula  $\text{Au Cy}^3 + \text{Ka Cy}$  requires 57.874 gold and 11.405 potassium. The crystallized salt lost in vacuum over sulphuric acid 3.755 per cent. water, and then no more up to  $356^{\circ}$ . The water of crystallization amounts therefore to  $1\frac{1}{2}$  atom.

The *Cyanide of Ammonium and Gold* was obtained by saturating a solution in water of cyanide of ammonium, prepared by distilling ferrocyanide of potassium, sal-ammoniac and water, with hydrate of the oxide of gold, warming the solution, filtering and evaporating the clear liquid in the water-bath to dryness; the residue was extracted with water, and the aqueous solution left to spontaneous crystallization. It forms large colourless 4- and 6-sided prisms which are easily soluble in water and alcohol, but hardly at all in æther, and which at  $212^{\circ}$  become milk-white from loss of water, subsequently yellow, giving off cyanide of ammonium and its products of decomposition, and leaving behind pure gold. The loss of water at  $212^{\circ}$  amounted to 5.056 per cent.; the residue of gold to 58.708 (=82.081 cyanide of gold); the formula  $\text{Au Cy}^3 + \text{N H}^4 \text{Cy} + 2 \text{aq}$  requires 81.637 cyanide of gold and 5.283 water.

When the double salt is extracted with water, as in the above method of preparation, a reddish yellow residue remains, which is insoluble in water, alcohol, æther and acids, and on heating explodes slightly. It is probably a compound of the oxide of gold with ammonia, which has originated by the decomposition of a cyanate salt, which probably had been formed contemporaneously with the per-cyanide of ammonium and gold. A cyanate salt would also form in the preparation of the protocyanide of potassium and gold, and its decomposition would be the cause of the disengagement of ammonia, which always occurs during evaporation, even when fulminating gold is employed instead of the hydrate of the oxide of gold.—*Ann. der Chem. und Pharm.*, xlii.

### *Preparation and Properties of Cathartine.*

This substance, the bitter principle of senna, is obtained in the following manner:—The decoction of senna leaves is precipitated with sugar of lead, filtered, the excess of the lead salt removed by sulphuretted hydrogen, again filtered, and the solution evaporated to an extract, which, on being treated with alcohol, leaves behind a gummy brown substance. The solution in alcohol contains a peculiar extractive substance, and moreover acetate of potash, and must



be treated with sulphuric acid to remove the potash; to the filtered liquid carbonate of lead is added to take away the excess of sulphuric acid, the lead then removed by sulphuretted hydrogen, and the liquid evaporated to an extract. What is left is the active principle of the senna leaves, *Senna bitter*, or *Cathartine* of Lassaigue and Feneulle, who discovered it. It has a dark reddish yellow colour, does not crystallize, has a peculiar smell and a bitter nauseous taste; it attracts moisture from the atmosphere, dissolves in water and in alcohol, but not in æther. It does not afford ammonia on distillation. It is decolorized and destroyed by chlorine, but is not affected by iodine. Alkalies give it a darker colour; it is precipitated of a brown colour by sulphate of alumina, light yellow by di-acetate of lead and by tincture of galls, but not at all by tartar emetic and neutral acetate of lead. It contains no vegetable alkaloid, and does not combine with acids. According to Feneulle, the *Folliculi sennæ* contain the same constituents as the leaves.

Peschier and Jacquemin state that they have found cathartine in *Cytisus alpinus*, *Anagyris foetida* and *Coronilla varia*; but this is very doubtful, as it is scarcely possible to prove the perfect identity of substances which cannot be obtained in a crystalline state, and possess moreover scarcely a single characteristic property.

#### *Extractum Tamarindorum.*

Gauger proposes, instead of the *Pulpa Tamarindorum*, which easily spoils and does not dissolve entirely in water, the following wholly soluble extract, which keeps well, and of which 10 lbs. may be obtained from 9 lbs. tamarinds; it may therefore be substituted for the *Pulpa*, and may also be employed in preparing the *Elect. tinct.* The tamarinds are freed from their stones, then boiled in a porcelain or well-tinned vessel for a quarter of an hour, with from three to four times their weight of water. The liquid portion is then separated by pressure in a linen strainer, the residue washed with some hot water, and again pressed. The liquids so obtained are mixed and left to settle, the clear liquid decanted, evaporated at a gentle heat to the consistence of solidified crude honey, and so much white sugar added that the whole amounts to ten-ninths in weight of the tamarinds employed.—Gauger's *Repert.*, 1842, p. 462.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the Manufacture of Sugar from the Corn-stalk (Zea mays).*

EXPERIMENTS have been made in the state of Indiana, which seem fully to prove that the stalks of the maize plant may be employed in the manufacture of sugar with much greater advantage than the juice of the beet or maple, and that it almost equals the sugar-cane. It is well known that the sugar-cane, as grown in Louisiana, does



not produce above one-third so much saccharine matter as when raised in Cuba and other tropical situations. In Louisiana 1 acre yields from 900 to 1000 lbs. of sugar ; and it appears, from experiments that have been made at Indianapolis and Lafayette, that 1000 lbs. of sugar may be obtained from 1 acre of corn-stalks\*. The juice of the corn-stalk contains more than 3 times as much sugar as that of beet, 5 times that of maple, and equals, if it does not exceed, that of the ordinary sugar-cane as raised in the United States. By plucking off the ears of corn from the stalks as they begin to form, the saccharine matter of the stalk is greatly increased. Experiments on a small scale have shown that 6 quarts of the juice obtained from the corn-stalk, sown broad-cast, yielded 1 quart of crystallized syrup, which is equal to 16 per cent., while the same quantity of syrup requires no less than 32 quarts of the sap of the maple for its production.

The corn-stalk requires a much smaller degree of pressure than the sugar-cane, and consequently there would be a great saving in machinery. The whole of the stalk, excepting the extreme top, can be used in the manufacture, which is not the case with the sugar-cane in this country.

The cultivation of the sugar-cane requires much care and attention, and it does not arrive at maturity under 18 months ; while the Indian corn can be raised with the greatest ease, requiring only from 70 to 90 days. The leaves afford an excellent fodder for cattle, and the stalks, after being pressed, may be used for the same purpose.

The plan for increasing the quantity of sugar in the stalk by removing the ears, was proposed some time since, but has never been carried into operation. If the manufacture from the maize plant should succeed, it is highly probable that in a few years the United States will import no sugar whatever. In 1840 the import of sugars amounted to 120,000,000 lbs. In 1841 30,000,000 lbs. of sugar were made from the maple and beet-root in the northern, middle and western states.—H. CROFT, *Upper Canada*.

*Manufacture and Analysis of Aventurine Glass. By Prof. WÖHLER.*

Aventurine is a brown glass flux, containing very small glittering particles, which give it a peculiarly brilliant appearance. It was formerly manufactured into objects of art and ornament at Murano near Venice. When my friend and colleague, Prof. Hausmann, whom I have to thank for these historical notices, visited the Venetian glass manufactories in 1819, it was no longer made, and nothing could be learned about the mode of its manufacture ; it appears to have remained a secret. The statements which are found respecting it in technological works, according to which it is obtained by fusing down with glass minute particles of gold, copper, brass,

\* In North America maize is always called *corn*.



mica or talc, are not correct, as the microscopic examination of aventurine plainly shows\*.

J. G. Gahn first observed that the glittering metallic particles in aventurine glass were crystals, which must have separated upon the cooling of the melted mass. When Hausmann was in Fahlun, in 1807, Gahn showed him these crystals under the microscope; they appeared to be regular six-sided and three-sided prisms. In fact, the examination of a small piece of aventurine under the microscope, only moderately magnified with a good light, affords a surprisingly brilliant aspect; we see that every little bright particle is a regular glittering crystal. The crystals are to all appearance segments of regular octahedrons, yet so thin that it is never possible to observe a perfect octahedron: they are also quite opaque. The glass mass in which they are situated is transparent, and appears in the thinner portions of a yellowish colour, with a bluish green tint in certain directions.

The formation of crystallized bodies in masses which have been formed at a high temperature, deserves great attention, especially in relation to our ideas respecting the origin of crystallized compounds in the mineral kingdom; and it was therefore interesting to ascertain what these crystals in the aventurine might be. Hoping to obtain some information on this point, M. Sneedermann analysed several samples of aventurine. It was not decomposed by acids, and was therefore melted, one portion with carbonate of soda, and another portion with carbonate of barytes, and the usual method for the analysis of silicates followed. The different pieces of aventurine varied somewhat with respect to the quantities of the constituents, as was expected from their dissimilar appearance, but they all contained the same constituents. The following is the mean from several analyses:—

Silica, with traces of oxide of tin.....	65·2
Phosphoric acid .....	1·5
Oxide of copper .....	3·0
Oxide of iron .....	6·5
Lime .....	8·0
Magnesia .....	4·5
Soda .....	8·2
Potash .....	2·1
Alumina, and traces of sulphuric acid....	traces
	<hr/> 99·0

From this composition it is evident that the aventurine is a common glass, coloured and rendered glittering by means of copper, probably in the form of a sub-oxide compound.

But the perfect opacity of the extremely thin crystalline laminæ speaks against this last supposition. The microscopic examination of the fine powder of metallic copper, which had been obtained by

\* The variety of rock crystal, which on account of its similar glittering nature has also been called aventurine after that glass, is not to be confounded with aventurine glass.



reduction with phosphorous or sulphurous acid from the solution of a copper salt, decided this point completely. Copper powder prepared in this manner, when examined with a magnifying power of from 50 to 80, presents an appearance quite similar to that of the glittering particles in the aventurine; it consists entirely of shining octahedral crystals, which exhibit sometimes 3, sometimes 6 lateral surfaces. There can be no doubt therefore that the crystals in the aventurine consist of metallic copper, which were separated in a crystalline state from the fused glass containing oxide of copper by the addition of some reducing substance. Two other circumstances speak in favour of this opinion; first, that this glass is so easily fusible that it is brought into a flux far below the melting point of copper; and secondly, that Hausmann possesses a brown copper slag, from Biber in Hesse, which incloses octahedral particles perfectly similar to those in aventurine.—*Ann. der Chem. und Pharm.*, Jan. 1843.

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## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

Jan. 17, 1843. (Arthur Aikin, Esq., Treasurer, in the Chair.) The following papers were read:—"On a new Method of obtaining pure Silver in the Metallic State, or in the form of Oxide." By Dr. W. Gregory.

After remarking on the practical difficulties and uncertain means of the processes in use for the preparation of pure silver and its salts, Dr. Gregory describes the action of alkalies on the chloride of this metal in the humid way. Caustic potash dilute, or even concentrated, has but little effect on chloride of silver in the cold; but if the solution be sufficiently strong, and the temperature raised to ebullition, the salt is completely decomposed and converted into oxide. The following plan is recommended:—The cupreous solution of silver is precipitated by common salt, and the chloride well washed by decantation with hot water; it is next covered to the depth of half an inch with a solution of caustic potash of spec. grav. 1.25 to 1.3, taking care to break down all lumps or hard masses with a platinum spatula, and the whole boiled for 10 minutes, or until the chloride has become converted into a heavy jet-black powder. If any white specks are observed, the mixture may be rubbed in a mortar, and once more boiled for a short time. When the decomposition appears complete, the oxide is to be carefully washed by decantation with hot water until all the saline matter has been removed.

The oxide of silver so obtained has a very different aspect from that precipitated by potash from the nitrate; it is a very heavy black powder, with, if anything, a tinge of blue, and is probably crystalline. It dissolves completely and easily in nitric acid, forming a colourless solution of pure nitrate. When heated to redness, oxygen is given off, and pure spongy metallic silver remains.



It is worthy of remark, that if the chloride of silver has been once dried, it is with great difficulty decomposed by the caustic alkali, even when the ebullition is continued a long time.

The foregoing process is strongly recommended by the author on the ground of great certainty, ease and rapidity of execution.

“Some Experimental Observations on the formation of Prussian Blue on the surface of Gravel, through the medium of Ferrocyanide of Calcium.” By Robert Warington.

In a communication which was made to the Society by Mr. Porrett on the above subject in May last\*, that gentleman considered the production of prussian blue to have arisen from some of the gas-lime employed to destroy the worms, &c., and placed under the fresh gravel, having been accidentally dropped on the surface, and that the peroxide of iron contained in the gravel had been deoxidized by some of the sulphur compounds of the gas-lime, giving rise to the formation of a combination of iron with cyanogen and calcium, and that this compound had been decomposed by the action of the carbonic acid of the atmosphere, or by the siliceous matter of the stone, thus causing the formation of prussian blue. It will be seen, on reviewing this subject, that two points of uncertainty arise, the first embracing the possibility of the ferrocyanide of calcium formed reaching the upper surface of the pebbles from below the gravel, and thus obviating the presumption that some of the gas-lime had been dropped on the surface of the gravel; and the second, as to whether the decomposition of this ferrocyanide was due to the carbonic acid of the atmosphere or the siliceous matter of the stone. It was with the view of determining these points that the following experiments were made. An artificial ferrocyanide of calcium was formed by mixing hydrate of lime and prussian blue to the consistence of a cream; and this was placed in an open part of a garden, and numerous white-coated siliceous pebbles selected from the red gravel of the neighbourhood of London, then partly immersed in the mixture, so that the upper surfaces might be exposed to the action of the atmosphere and moisture; in a few days the sides of the pebbles assumed the blue colour, which gradually spread itself to the summits, having the same bright tint as the pebbles presented to the Society by Mr. Porrett, proving therefore that the ferrocyanide had been drawn to the surface, either by that curious species of crystalline growth, if the expression may be allowed, which forms a characteristic of so many saline combinations during their crystallization, or by capillary attraction united with evaporation upon the exposed parts of the pebbles, thus rendering it evident that the ferrocyanide might reach the summit of the gravel from below.

Other substances were then submitted to the same action, to decide the question as to the siliceous matter of the stones being in any way instrumental in the production of colour. White limestone pebbles, from the south coast of Devon, and baked pipe-clay, un-

\* See Proceedings of Chemical Society, p. 35, vol. i.



derwent the same changes, with the exception that the blue tint was not so bright and clear as was the case on the siliceous surface; but this is considered attributable more to the perfect whiteness of the siliceous coating, and the decidedly superficial film of prussian blue which was produced on it. Independent of this, the effect can only be attributable to the action of the carbonic acid gas present in the atmosphere slowly decomposing the ferrocyanide of calcium and generating the blue stain.

“On the Preparation of Malic Acid from the Culinary Rhubarb.” By Thomas Everett, Esq.

After premising on what had been previously published on this subject, the author details the method he adopted, after much investigation, for the perfect separation of the malic acid. It consists in first removing the cuticle from the leaf-stalk, and submitting them to pressure in a canvas bag, so as to obtain the juice; to this slaked lime is added till the solution becomes alkaline; it is then to be boiled and filtered. To the clear liquor add nitrate of lead, when a copious bulky precipitate of malate of lead forms; the whole is then to be brought to the state of ebullition, and the clear decanted solution will deposit good crystals of malate of lead on cooling. The precipitated mass must be carefully washed, acted upon by sulphuric acid, gently heated, and the sulphate of lead thus formed separated by a filter; the other part of the malate of lead is then added to this solution, and sulphuretted hydrogen gas passed through until all the malic acid is set free. The author recommends this method in preference to making the whole of the malate of lead at once by this process. The sulphuret of lead is to be separated by filter, and the malic acid concentrated to a syrup in a water-bath. The analysis of the rhubarb, and the separation of all the various salts therein contained, are given in detail.

### *Meeting of the Royal Institution.*

Friday, Feb. 10, 1843.

The lecture for this evening was by Mr. Grove, on “A gaseous voltaic arrangement.”

Mr. Grove gave a cursory account of the progress of galvanic or voltaic electricity to the present day, and argued strongly against the contact theory, and stated, in proof of his argument, that if Volta's discs of metal were kept separated by a thin ring of paper, electricity was equally developed as when they were placed in contact. The lecturer considered, first, that without chemical action there is no voltaic action; secondly, that the quantity is dependent on the extent of chemical action, increasing or decreasing in the same ratio; and, thirdly, that all chemical action may, by proper means, be converted into galvanic. Numerous experiments were shown in illustration of these views, and the subject was thus brought up to the point in which, instead of employing fluids and solids, gaseous matters became the media of experiment. The action of clean and spongy platina on hydrogen gas and atmospheric air was



advanced as an instance of voltaic action, "in which the gases might be represented by Pyramus and Thisbe, and the platina by the chink in the wall, or medium of communication." The lecturer then exhibited and explained his gaseous battery, which has already been fully detailed, and proved by experiment that, from an arrangement, we believe, of 40 pairs of platinized plates, the spark could be elicited, and that water had been decomposed.

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## REVIEWS.

*Lectures on Chemistry, illustrated by 106 Woodcuts.* By HENRY M. NOAD. London: Scott, Webster and Geary.

THE present volume, consisting of a series of lectures, was brought out in parts, and will probably be in the hands of many of our readers. Being now complete, we should fail in our duty were we to neglect noticing a work written expressly for the use of those persons who, not having enjoyed the advantages of a good chemical education, require some digest of the rudiments of the science to prepare them for availing themselves of the valuable manuals that have appeared of late years in this country; and of others, who, being devoted solely to the practical bearings of chemistry, have no particular desire to make themselves acquainted with the innumerable compounds, both inorganic and organic, which have merely a scientific interest, but which necessarily fill the pages of works of higher pretensions.

These lectures are elementary, and especially practical; whether treating of the science in its various applications to the arts and manufactures, or to that new field created by the genius of a Liebig, and which promises to be of the most essential service to the human race,—we mean agriculture. We are glad that Mr. Noad has devoted so much space to this important subject, which is very well discussed. Great attention is paid to analytical chemistry, and a table is affixed to the volume, exhibiting a general view of the metals, &c., their compounds with oxygen, chlorine and sulphur, and their behaviour towards reagents and before the blowpipe: a full description is also given of the methods of conducting organic analysis, and among these the new and valuable method of Varrentrapp and Will for determining nitrogen in organic substances, with an explanation of the *rationale* of the process. The whole is written in a pleasing, fluent style, as might be surmised from its having been prepared for a series of public lectures; and we can heartily recommend it to the general reader and the student.

*A Guide to the Urinary Cabinet; being Concise Directions for a Chemico-pathological Examination of the Urine and Urinary Concretions, &c.* By R. VENABLES, A.M., M.B. London: Knight and Sons.

We need not dwell on the importance of the results afforded by the chemical investigation of the urine in cases of many obscure



diseases, nor assert that every practitioner should be able to conduct such examinations; this will be granted by every one in the profession. Unfortunately, however, this is not the case, for many, from an erroneous apprehension of the great extent and refinement of the chemistry requisite for the purpose, and from a very inaccurate idea of the little apparatus necessary, give up such inquiries. It is therefore with pleasure we find that Mr. Knight, of Foster-lane, has arranged a portable "Urinary Cabinet," containing all the utensils and reagents required in such analyses, to which the little work in question is a guide. The author describes the various substances which occur in the urine, their behaviour towards the several reagents, gives some general rules for conducting such analyses, and briefly notices the diseases of which certain appearances are characteristic.

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### PATENTS.

*Patent granted to Henry Waterton, Gerard's Cross, Buckinghamshire, for Improvements in the Manufacture of Sal-ammoniac.*

These improvements consist in decomposing common salt by means of carbonate of ammonia, and thereby producing sal-ammoniac.

Two modes of effecting this are described. The first consists in making a saturated solution of common salt in water, and mixing with it a quantity of finely pulverized carbonate of ammonia, about equal in weight to the salt contained in the solution. The mixture is agitated in a close vessel for 6 or 8 hours, and as much carbonic acid gas is infused therein as it will absorb (but the introduction of the gas is not absolutely necessary, although the patentee prefers it); the liquid is then separated from the solid matter by filtration and pressure. The solid matter is chiefly bicarbonate of soda, and the liquid holds in solution muriate and carbonate of ammonia and common salt, and sometimes a small portion of the bicarbonate of soda.

The liquid is now placed in a distilling vessel, and the carbonate of ammonia being distilled over into a suitable receiver, a solution of muriate of ammonia and common salt remains in the still. This solution is evaporated by heat to such a consistency as will cause the separation of the common salt by crystallization, and the salt thus crystallized is evaporated from the liquid by any convenient method. The liquid is then evaporated until it attains the proper specific gravity for crystallizing, and it is transferred into suitable utensils for that purpose. The crystals produced by these means are nearly pure muriate of ammonia, and, when pressed and dried, may be brought to market without further preparation, or they may be sublimed into sal-ammoniac.

The other mode of manufacturing sal-ammoniac consists in taking a quantity of liquid containing ammonia, either in the caustic state or combined with carbonic, hydrosulphuric or hydrocyanic acid (such as gas ammoniacal liquor, or bone ammoniacal liquor,) and



rectifying it by distillation until the distilled portion contains from 20 to 25 per cent. of carbonate of ammonia. If the liquid contains any other acids than those above mentioned, a sufficient quantity of lime is used in the distillation to decompose the ammoniacal salt.

The distilled liquid being now mixed with as large a quantity of powdered common salt as it will dissolve, is agitated for several hours, and as much carbonic acid gas is infused into it as it will absorb. The remainder of the operation is the same as before described in the first method of manufacturing sal-ammoniac.—Sealed Aug. 27, 1840.

*Patent granted to Alphonse Rene le Mire de Normandy, for certain Improvements in the Manufacture of Soap.*

The improvement consists in introducing into soap made or manufactured in the usual way the compounds of salts of potash and of soda, in general, but more particularly the sulphates and carbonates of potash and of soda, either in the solid, melted or dissolved state\*.

The doses and substances which have been found to answer best are for 80 lbs. avoirdupois of soap, 28 lbs. of sulphate of soda, and 4 lbs. of carbonate of soda or of potash; or 2 lbs. of each of the two last-mentioned substances. Or if the substances are used singly, then 32 lbs. only of sulphate of soda for 80 lbs. of soap; or 15 lbs. only of sulphate or carbonate of potash for 80 lbs. of soap; or 10 lbs. only of carbonate of soda for 80 lbs. of soap.

Soap being in process of manufacture in the ordinary way, when it is ready to be taken away from the boiler, in consequence of the process of saponification being complete, and what is technically called turned over into the cleansing copper, while in a liquid and hot state, for every 80 lbs. avoirdupois of soap, 28 lbs. avoirdupois of sulphate of soda, and 4 lbs. avoirdupois of carbonate of soda or of carbonate of potash, or 2 lbs. of each of these two last-mentioned substances are thrown into it, in a solid state or in a lump, amorphous state and pulverized, or in the state of crystals or any proportions of each ingredient, as may suit the purpose of the manufacturer; the soap being harder or softer in proportion as the quantities of carbonate and sulphate of soda or of potash predominate. This being done, the whole is mixed together until the mass is quite homogeneous. The soap having been thus treated, is then to be removed from the copper in which the operation has taken place, and is to be poured, as usual, in frames or reservoirs to cool, and when cold it may be cut into bars, as ordinarily done, for sale.

It may in certain cases prove advantageous to operate upon soap already made, and to re-melt it for that purpose. In this state the sulphate and the carbonate of soda or of potash, in the proportions before mentioned, are to be thrown into it, and the whole is to be well stirred together until it is quite homogeneous, then the mass may be taken out and poured into frames to cool. With respect to the soaps with base of potash, that is soft soaps, the same treatment

\* We do not understand how this can be called an *improvement*.—ED.



is to be applied to them which was described for the soaps with base of soda.

*Patent granted to John Wilson, Liverpool, Lancaster, for an Improvement or Improvements in the Process or Processes of Manufacturing the Carbonate of Soda.*

The first part of these improvements consists in manufacturing carbonate of soda from a solution of sulphuret of sodium, by the employment of bicarbonate of soda.

The bicarbonate of soda is added to the solution of sulphuret of sodium, in the proportion of 85 parts of the bicarbonate to 48 parts of the sulphuret; heat being then applied, sulphuretted hydrogen gas is evolved, and carbonate of soda remains.

If it is considered requisite that the gas should be collected, the carbonate of soda is manufactured in an iron pan, the cover of which is securely closed by a sand or water-joint, and is furnished with a pipe to convey the gas into a gas-holder. After the gas has been evolved, the impure carbonate of soda is removed to a common white ash furnace, and heated to dryness; then, by dissolving it in water, and allowing the solution to settle, a clear liquor is obtained, which is afterwards concentrated by boiling, and allowed to crystallize; or the carbonate may be obtained in the state of a protohydrate by evaporating the solution.

When the gas is not required to be collected, the operation is carried on in a reverberatory furnace, of the kind usually termed white ash furnaces. The mixture of bicarbonate of soda and the solution of sulphuret of sodium is kept well stirred until it becomes quite dry, and then the impure carbonate is treated in the way described in the first process.

The second improvement consists in adding to a solution of black ash as much bicarbonate of soda as will saturate the caustic soda which it contains, and convert it into carbonate of soda.

The carbonate can be obtained in crystals, by allowing the solution of black ash to settle, when it has attained a specific gravity of 1.720, or about 54° of the common hydrometer, and afterwards decanting the clear liquor into coolers to crystallize; or the carbonate may be produced in the state of a fine salt by evaporating the solution.

The third improvement consists in preparing carbonate of soda from soda ash, by dissolving the latter, and saturating the caustic soda contained in it, by the addition of bicarbonate of soda; the remainder of the operation is the same as when the black ash liquor is employed.

Sesquicarbonate of soda may be substituted for the carbonate of soda in any of the above processes; but, in that case, 2 parts of the sesquicarbonate must be used in place of 1 part of the carbonate.

The patentee claims the use of bicarbonate of soda and sesquicarbonate of soda in preparing carbonate of soda from a solution of sulphuret of sodium; also the use of bicarbonate of soda and sesquicarbonate of soda in preparing carbonate of soda from a solution of black ash or from soda ash.—Sealed Feb. 25, 1840.



# THE CHEMICAL GAZETTE.

No. X.—March 15, 1843.

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## THE PHARMACEUTICAL SOCIETY AND ITS CHARTER.

THE objections which we made in our last Number to the proceedings of the Pharmaceutical Society, have excited, as was to be expected, considerable anger in those concerned in them, and at the same time abundance of communications from chemists in town and country, who perceived the justness of our charges, and suggest others no less weighty. Let it be understood, we are not hostile to the Pharmaceutical, or any other Society formed for the purpose of advancing science; and had that Society fairly pursued the usual course of such associations, had it not deviated into practices to which the term ambiguous, if not a more harsh one, is justly applicable, we would have given it our hearty support and cooperation. The ordinary practice in forming learned or scientific societies, is to obtain in the first instance a very *limited* number of names, and these the best known and most zealous cultivators of the science which is to be its object. These names being obtained, the Society being constituted, no subsequent admissions are permitted except by ballot, and future candidates are recommended and elected upon the sole ground of their being fit persons, from their known ability to advance its objects. But this Pharmaceutical Society not only kept open its doors of admission to all comers, but urged the timid and the wavering by threats and promises, until a heterogeneous mass has been accumulated to which there is no parallel. Apprentices of a year's standing, multitudes who have served no apprenticeship, assistants of all grades, no matter what their character, no matter what their knowledge or ignorance. Walk in! walk in! pay your money! this is the only qualification! this the only test of your fitness to associate with us! In this way the call for all persons to join indiscriminately was pursued for upwards of twelve months. Threats of a rigid examination as the future door of entrance; promises of protection against non-members even acting as chemists and druggists, &c.; the tempting bait of a splendid diploma, not to be got however until the second year's subscription is paid! Who could resist such temptations?

And now the Charter. Upon the cover of the last Number of the 'Pharmaceutical Journal' is the following announcement: "The  
*Chem. Gaz.* 1843.



Council have the satisfaction of announcing that Her Majesty has been pleased to grant a Charter of Incorporation to the Pharmaceutical Society." This pompous announcement shall not mislead *our* readers. It is, let them remember, exactly parallel with "Her Majesty has been pleased to grant her Royal Letters Patent to Mr. Spout for his Liver Restoring Pills." A charter of incorporation is obtained, as a matter of course, by every Society willing to pay the necessary fees. It confers no such privileges as the Pharmaceutical Society has promised its members. It will serve only to supply a good subject upon which to hinge new and ridiculous pretensions. It will *not* protect the chemist and druggist from the competition of the grocer, nor prevent the continuance of the present evils which avowedly beset the trade on all hands. It is a virtual resignation of the claims of the chemist and druggist to be protected by the law.

The Medico-Botanical, the Medico-Chirurgical, the Geological, and many other Societies, are incorporated by Royal charter. Do the Councils of these Societies arrogate to themselves the power of preventing any man from pursuing a trade or profession without a license from them? Do they examine candidates and grant diplomas?

But of what value is the promised diploma? None whatever. The public will soon discover that it is a mere bauble, purchased for a trifling sum. Some years ago there were some Societies existing in London who thus gave diplomas, and the end of them was, that they could be purchased at the sum of five shillings; and we do not hesitate to assert, in the present instance, that many persons whose value for four guineas is beyond the estimate they place upon a pretty piece of engraving, will seek to procure one at a more reasonable price of 2*s.* 6*d.* to 5*s.*, and we are sure there are engravers in London who will engage in this speculation.

But who grants this diploma of proficiency in the art and mystery of pharmacy? The present Council of this Society, from their past practices, have shown themselves utterly unworthy of the trust reposed in them of conducting the affairs of a Society for the advancement of science; and the indiscriminate distribution of a diploma, which is intended to convey the impression that its possessor is a qualified person, will confer a deep and lasting injury upon the trade. It may be stated, there is nothing said of qualifications upon the face of the diploma. Probably not. And yet such an inference constitutes its sole value. This is an equivocal proceeding, which corresponds with every act of the Council. It is not straightforward and plain dealing. Is such a body, then, qualified to examine, grant diplomas, and control the important business of the chemists and druggists of this kingdom?

## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Action of Potash upon Cholesterine.* By J. LAWRENCE SMITH, M.D., of Charleston, South Carolina.

For some reasons we should be induced to place cholesterine among the fatty bodies, but from many of its characters it would



appear certainly not to belong to this class. The most important distinctions between these two bodies are—first, the want of action of a solution of potash upon cholesterine; and secondly, its high point of fusion, which is  $298^{\circ}$  Fahr\*.

Another difference which I am able to point out is, that cholesterine is heavier than water, whereas the fats are lighter. It will be found, in works on chemistry, that cholesterine is lighter than water, and I attribute this to the fact, that the substance, as it crystallizes out of alcohol, is found to float on the surface of water; but this is owing to the air adhering to the crystals. To show that it is heavier, all that is necessary to be done is to throw a small piece of fused cholesterine into a vessel containing water, that must afterwards be made to boil (this is done to drive away the air adhering to the surface of the body), after which it will be found to sink, and remain at the bottom of the vessel even when the water is cold. I dwell thus much upon this subject, because I feel confident that there are other organic bodies that are said to be lighter than water, but which are actually heavier; for owing to the looseness of their structure, air insinuates itself between the molecules, and is afterwards held so firmly that it is impossible to drive it away by the ordinary means.

Chevreul and others have shown, that if cholesterine be digested a great length of time in a boiling solution of potash no change takes place; but here the cholesterine is not subjected to the action of the potash under the same circumstances as the fats; for in the case of the latter, the point of fusion being considerably below that of boiling water, the force of aggregation is in a great degree destroyed, and consequently does not oppose itself to the chemical action; whereas in the case of cholesterine, its point of fusion being much higher than that of boiling water, it remains solid, and therefore its force of aggregation opposes itself strongly to the action of potash (supposing one to exist). So then the difference of the action of a solution of potash upon these substances is not such a strong mark of distinction as it would at first sight appear to be, as it is impossible to subject them to this action under similar circumstances.

This fact is mentioned, not to show that cholesterine may be a species of fat—far from it; it is simply to attempt to exhibit that there is no stronger reason for supposing that cholesterine is not a fat because a boiling solution of an alkali does not act upon it, than there is for considering spermaceti a fat because it is acted upon; as here the spermaceti is in a state of fusion, one that is favourable to this action, and the cholesterine solid, a state opposing this action.

In an article on spermaceti, published some time since, I stated my reasons at large for not believing this body to be a fat, properly speaking, and at the same time explained how I supposed an alkali to react upon it; it was there ranked with ethal and cholesterine.

\* The melting point of most of the fats is below  $140^{\circ}$ .



I then also stated, that although a boiling solution of an alkali might not react upon cholesterine, still I had no doubt that the alkali by itself, aided with a high temperature, would react upon it in a manner similar to that which it did upon spermaceti. From the kindness of M. Pelouze, who furnished me with a small quantity of cholesterine, I have been able to examine into the truth of this supposition.

The first circumstance necessary to be observed in the examination of this reaction, is to have the cholesterine intimately in contact with the potash, and this is done by rubbing together equal parts of the two substances in a mortar. The mixture was placed in a watch-glass, and spread out so as to expose a large surface to the air; the watch-glass was placed on a support in a copper vessel (the air contained in this vessel could be brought to any required temperature); the experiment being thus disposed, the vessel was heated, and by the time that the air in the interior arrived at  $248^{\circ}$  Fahr. a change began to take place in the mixture, and at  $266^{\circ}$  Fahr. it was of a dark brown colour.

This was now treated with cold æther, which dissolved the unaltered cholesterine, and also a matter of a resinous character, which when dissolved in alcohol, and the alcohol allowed to evaporate spontaneously, was deposited in the form of little round concretions entirely devoid of crystalline structure; it is not soluble in any of the alkalies. What remains after the treatment by æther is of a brown colour and completely soluble in water. If hydrochloric acid be added to this solution, it is decomposed, and a yellowish substance rises to the surface. This substance is soluble in æther, alcohol, potash, soda and ammonia, as well as their carbonates; it does not crystallize, its alcoholic solution reacts slightly acid upon litmus paper. In fact it is an acid of a resinous character; its combinations with alkalies have the character of soaps. Its silver salt is of a yellow colour, but soon becomes black by exposure to the light.

From the small quantity of cholesterine that was at my disposal, I have not been able to obtain sufficient of the acid to examine its composition, but I have no doubt that it is a new one.

If the mixture, when heated, be not well exposed to the air, very little of this acid is formed, even if we elevate the temperature as high as  $300^{\circ}$  Fahr.; but, on the contrary, a considerable quantity of the resin before mentioned (soluble in æther) is formed; this though is capable of being converted into the acid by the action of potash, a high temperature, and free access of air. Thus then it will be seen, that the action of potash, instead of being a means of showing that spermaceti and cholesterine are two substances of entirely different natures, affords strong evidence of their being similar bodies. Further, the action of potash upon spermaceti is to produce ethalic acid and ethal, the former capable of forming soaps with the alkalies, and the latter of being converted into the former by an alkali and a high temperature.

The action upon cholesterine is to form an acid (which it is im-



possible for me as yet to name) and a basic resin; the first forms soaps with alkalies, and the latter by the action of potash at a high temperature is converted into the former.

It is evident that spermaceti and cholesterine belong to a class of bodies which will no doubt be found to be tolerably numerous, and which class I propose to call *pseudo-fats*. Among them may be mentioned spermaceti, cholesterine, ethal, ambreine, and probably stearérine and elaiérine, two fatty substances found in linseed oil, and which M. Chevreul brought to the notice of the Academy of Sciences not long since. This class of bodies would appear to be a link between the fats and resins.—*American Journal of Science*, Jan. 1843.

*On the Composition of Gamboge.* By M. BUCHNER.

When finely powdered gamboge is treated with absolute æther, and left for some time in contact with it, it acquires a dark yellow colour, and on driving off the æther a hyacinth-red transparent resin remains behind. This resin is extremely soluble in æther, with difficulty in alcohol, not at all in water, and is void of smell and taste. When pulverized it forms a beautiful yellow powder. It dissolves in caustic ammonia, when warmed, to a deep hyacinth-red solution, from which it is precipitated by a concentrated solution of carbonate of potash or of carbonate of ammonia. The solution of the resin in ammonia is precipitated brownish yellow by nitrate of silver, yellowish red by neutral acetate of lead, dark orange by basic acetate of lead, tile-red by salts of barytes, brown by protosalts of iron, bright yellow by protosalts of tin, and green by sulphate of copper. It is dissolved by concentrated sulphuric acid to a red liquid, and also partially by nitric acid, from the former of which it is precipitated on dilution with water in a modified form. From its decomposing the carbonated alkalies on boiling, dissolving easily in dilute solution of caustic potash, and further, from the alcoholic solution having an acid reaction, and not being precipitated by ammonia, it is evident that the resin has decidedly the character of an acid, and belongs to the class of the fat acids. In an analysis of the fat acid, M. Buchner obtained 72·0 carbon, 7·19 hydrogen, 21 oxygen. The silver salt was obtained by precipitating the solution of ammonia with nitrate of silver; it is a dirty, yellow shiny precipitate, somewhat soluble in water. It was found to contain 18·73 per cent. oxide of silver. The lead salt, which was obtained in precisely the same manner, afforded 34·48 oxide of lead, and the combination with barytes gave 10·31 per cent. barytes.

For the above three compounds the author proposes the following formulæ:—

Silver salt . . . . .  $\text{C}^{60} \text{H}^{35} \text{O}^{12} + \text{Ag O}$

Lead salt . . . . .  $2 \text{C}^{60} \text{H}^{35} \text{O}^{12} + 5 \text{Pb O}$

Barytes salt . . . . .  $4 \text{C}^{60} \text{H}^{35} \text{O}^{12} + 3 \text{Ba O}$

After the gamboge had been treated so long with æther that only traces were taken up, the residue was acted on with absolute alcohol. At the usual temperature it has little action on it, but when boiled



it becomes of a dark yellow colour. The residue, which remains on distilling off the alcohol, forms, dried at  $212^{\circ}$ , a viscid, moist, red brown extract, which easily dissolves in water. It differs from the fat acid contained in gamboge by its solubility in water, and from the gum by its solubility in alcohol.

The gummy residue which remained after complete extraction with alcohol was dissolved in boiling water, and the gum thrown down by hot alcohol. It was found to contain in 100 parts—

Carbon	44.94
Hydrogen	6.11
Oxygen	48.95

Whence it would seem that this substance possesses the elementary composition of starch or of anhydrous sugar; and the author was, on this account, induced to infer that this gum might be converted into mucic acid by treatment with nitric acid, or into sugar by means of dilute sulphuric acid, which was found to be the case.—*Ann. der Chem. und Pharm.*, Jan. 1843.

*On some Obscure Cases of Poisoning. By Dr. CHRISTISON.*

At the meeting of the Medico-Chirurgical Society of Edinburgh, on the 4th of January, Dr. Christison read “An Account of some Obscure Cases of Poisoning.”

The first case, to which this section of the paper was confined, was one of death, supposed to have been caused by spirits accidentally poisoned. Nine masons, who had been working hard in a quarry during a hot day, from an early hour in the morning until one o'clock, drank at that hour, in the course of a short period, seven half mutchkins, or about fifty-six ounces of a sort of “gin” manufactured by a travelling spirit-dealer, who sold it to them on the spot. None of them seemed to have had less than two glasses, or more than four, that is, from four to eight fluid ounces. They had no food after an early breakfast, except a little bread and cheese, which one of the party divided among a few of them just before they took the spirits. No particular taste was observed in the spirits at the time, though one of the party at first demurred to drinking it because it became milky with water. Two of the men, who had at least their full share, experienced no particular effect. Three others seem to have also experienced little effect but some headache in the evening. Two others, observing the serious effects produced in the subsequent cases, made themselves vomit, and also experienced subsequently nothing but inconsiderable headache. The seventh felt the liquor “go to his head” immediately, and continued to feel “stupid” for the whole evening.

The eighth, who had taken four glasses, became in ten minutes suddenly stupid, and speedily quite senseless; in which state he remained for some hours, till he was roused by emetics and stimulants; and subsequently he had pain in the stomach for the rest of the evening, and all next day sickness and drowsiness. The ninth, who had taken certainly not more than three glasses, possibly only



two, fell down suddenly insensible five minutes after having taken his last glass, and in five minutes more he expired. This was a man of sixty-three, in good health at the time, not intemperate, yet accustomed to take his glass occasionally, like other workmen of his acquaintance. He was one of those who had a little bread and cheese before the drinking match commenced. The body was very carefully examined, under authority of the sheriff of the county where the accident happened, but no morbid appearance whatsoever was found.

The spirit-dealer's stock was seized for examination. The "gin" he sold to the men had a juniper odour and taste, without any bitterness or ratafia flavour; and a careful chemical analysis did not indicate the presence of any hydrocyanic acid, or of any vegetable poison which could cause such an accident as that described above. He stated the gin was made with whisky, oil of juniper, and tincture of sweet bay. Whisky found in his house was found to be free of poison. A bottle, alleged to be oil of juniper, was really that substance mixed with a little spirit. Another bottle, represented to contain a tincture of sweet bay-leaves, had the taste and odour of the leaves of *Laurus nobilis*, and was free of hydrocyanic acid. The plant from which he said he gathered his leaves grew in his own garden, and was ascertained to be really the sweet bay, or *Laurus nobilis*. There was therefore not a single circumstance to warrant the suspicion, which actually arose at first, that the man had used by mistake the common bay, or *Cerasus laurocerasus*, the cherry laurel.

A careful inspection of the whole particulars, made by the law authorities after consultation with the author, did not throw any further light on this extraordinary case. The author, admitting its nature to be very obscure, was inclined on the whole to the opinion that the sole agent was alcohol, and that its diversified effects on the men depended on obscure constitutional circumstances.

Dr. Christison stated, in an appendix to his paper, that he had recently succeeded in detecting arsenic in the liver of a person who had died of poisoning with that substance, and whose body had been buried three months. The process followed was that of Orfila and Marsh, with some immaterial modifications.

He further announced that he had detected alcohol in the stomach in two instances where spirits had been taken not long before death, and where a considerable period had elapsed between death and the date of examination. In one instance the body had been buried about three weeks, in the other no less than three months, and the contents of the stomach had in each case been kept six weeks longer. The process of analysis consisted in cautious distillation from carbonate of potash, neutralization of the distilled fluid with sulphuric acid to remove ammonia, redistillation till a fifth of a fluid passed over, and the agitation of the new distilled liquor with dry carbonate of potash. A clear colourless liquor rose to the surface, presenting all the characters of rectified spirit, and amounting, in the case of three months' interment, to one fluid drachm of the density .836. The author concluded with observing, that the possibility of detect-



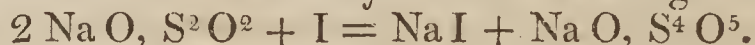
ing alcohol in such circumstances was, as far as he was aware, a new fact in toxicology.

Dr. Christison lastly observed, that on the two occasions just alluded to, he had applied for the detection of arsenic the process lately proposed by Reinsch, and had obtained most satisfactory results. In medico-legal investigations he considered it superior to every other process of equal delicacy, greatly superior to every other in point of convenience where complex fluids or mixtures of organic solids were to be examined, and a process which on the whole was likely to supersede all others hitherto proposed.—*Lond. and Edinb. Med. Journ.* for March.

*On a New Acid of Sulphur.* By MM. FORDOS and GELIS.

Scarcely has science been enriched by M. Langlois with the sulpho-hyposulphuric acid  $3\text{S} + 5\text{O}$ , than the authors discover an acid containing 5 atoms of oxygen to 4 of sulphur, which they have called bisulpho-hyposulphuric acid (*acide hyposulfurique bisulfuré*). When iodine is brought into contact with a hyposulphite salt, there originates, according to the general view, sulphuric acid and hydriodic acid as with the sulphurous acid. But this view is incorrect; hyposulphites absorb very much iodine without forming sulphuric acid, for hyposulphite of barytes diluted with 4 to 5 times its weight of water remains perfectly clear. The authors examined the reaction more closely, employing a perfectly pure crystallized hyposulphite of soda, which had been found by accurate analysis to have the composition  $\text{S}^2\text{O}^2\text{NaO} + 5\text{aq}$ .

A solution of the hyposulphite of soda dissolves iodine very rapidly, without the neutrality of the solution being destroyed or the liquid coloured; only after perfect saturation does it acquire a yellow tint. There is neither any sulphurous acid disengaged, nor a deposition of sulphur, and the solution is not precipitated by salts of barytes. The quantity of the iodine dissolved amounts in weight to the half of the crystallized hyposulphite of soda. The liquid contains an alkaline iodide; when left to stand for some time and heated to boiling it is decomposed, sulphurous acid being liberated, sulphur deposited, and the liquor contains sulphuric acid, resembling therefore entirely Langlois's acid, with this difference, that the amount of the precipitated sulphur is twice as great. The reaction which takes place on dissolving the iodine in the hyposulphite of soda can therefore only be the following:—



All the other hyposulphites absorb precisely in the same manner as the soda salt, half an equivalent of iodine. When the hyposulphite of lead is employed iodide of lead is thrown down, and the lead salt of the new acid remains alone in solution, from which it may then be isolated by decomposition with sulphuretted hydrogen. The barytes salt is however still better adapted for the preparation of the acid; the hyposulphite of barytes is mixed with a little water and iodine added; gradually the hyposulphite of



barytes disappears, and iodide of barium, together with the new salt, are dissolved; but soon the new salt is precipitated, from its not finding sufficient water present, in flakes; and on complete saturation, a thick paste is obtained, from which the excess of iodine and the iodide of barium may easily be extracted by means of concentrated alcohol. The residuous white powder is dissolved in as little water as possible, and crystals are then easily obtained by spontaneous evaporation of the solution, or by the addition of alcohol. These crystals are perfectly permanent in the atmosphere, but when exposed to heat they give off water, sulphur, sulphurous acid, and leave behind a sulphate salt. When the salt is dissolved in 100 parts water, and is then treated with chlorine, the whole of the barytes is obtained in a state of sulphate; if it is filtered, and nitrate of barytes then added to the solution, a thrice larger amount of sulphate of barytes is obtained, so that there are evidently 4 atoms of sulphur to 1 of barytes in the salt. The liquid, moreover, contains for each equivalent of the salt employed 7 equivalents of muriatic acid, so that 7 atoms of water must have been decomposed to furnish the oxygen for 4 atoms of sulphuric acid, a proof that the acid itself contains 5 atoms of oxygen. The new acid may be isolated from the barytes salt precisely in the same manner as described by Gay-Lussac and Walter in the case of the hyposulphuric acid. It may be tolerably concentrated, it is colourless and transparent, decomposes in the heat into sulphur, sulphurous acid, and sulphuric acid; it is not affected by hydrochloric or sulphuric acids, but nitric acid separates sulphur; it does not precipitate salts of zinc, iron or copper, but sesquichloride of tin and chloride of mercury white, protonitrate of mercury yellowish, becoming black by an excess of acid; nitrate of silver white, subsequently becoming yellow. These characters sufficiently distinguish the new acid.—*Comptes Rendus*, xv. p. 920–923.

#### *Occurrence of the Colouring Matter of the Gall in the Blood.*

J. Vogel has frequently found this substance in the blood of persons who were not afflicted with jaundice. The serum is then generally yellowish green, and nitric acid carefully added to it produces a grass-green colouring, both of the liquid and of the precipitated albumen, which is rendered blue, and subsequently reddish by more nitric acid.—Wagner's *Physiology*, 2nd edit. p. 237.

#### *On Indian Copal. By M. FILHOL.*

Distinction is made in commerce\* between hard and soft copal; the principal kinds of the hard copal are—1st, that from Madagas-

\* The following statements differ somewhat considerably from those generally entertained relative to the various kinds of copal of commerce; however, the probable non-Indian origin of the so-called East Indian copal is confirmed by M. Perrotet's communication (see page 267.) The author takes no notice of the copal said to be derived from Sierra Leone, and seems to consider the West Indian not to be a true copal.—Ed. of *Pharm. Central-Blatt*.



car, in large, flat, lemon-yellow pieces, which are very hard, void of taste and smell in the cold, but diffusing a strong aromatic odour when thrown on incandescent coal; it is somewhat rare; 2nd, the Indian copal, which is the most frequent kind of commerce; it is always rough on the surface from impressions of sand; the best kind is that which comes from Calcutta, which is nearly colourless and in small flat pieces. Mixed with this occur large, angular, verrucous, lemon-yellow pieces, which appear to be identical with the yellow pieces known under the name of Copal of Bombay, which are rough and brownish-red on the surface, but interiorly quite transparent. In Giubourt's collection there is a yellow, tear-shaped, rough kind, but which is not coloured brownish-red externally, that belongs to this division. Most of the author's experiments were made with Bombay copal. 3rd. Some other kinds of copal are met with, but very rarely, said to be from Brazil and South Africa. Unverdorben experimented with African copal, without, however, describing the kind more precisely. It seems, however, that all the copal comes to us from India, whatever be its first origin, and this accounts for pieces of all the above distinct kinds being frequently met with in the so-called copal from Calcutta. There is, moreover, a gradual transition from the white copal of Calcutta into the yellow of Bombay, so that it is scarcely possible to consider the two as being actually distinct. The greater or less purity, and the care employed in collecting and purifying it, alone cause the distinction. The identity of all the Indian copal is confirmed by the following elementary analysis:—

	Copal from Calcutta.		From	From
	Quite white.	Yellowish.	Bombay.	Madagascar.
Carbon . . . .	80·34	80·29	79·70	79·80
Hydrogen . .	10·32	10·57	10·40	10·78
Oxygen . . . .	9·34	8·77	9·90	9·42

The author classes, therefore, the more or less coloured copal from Calcutta and Bombay under the generic name of Indian Copal.

Gay-Lussac found 76·8 carbon in copal resin, which is explained from its rapid oxidation when exposed to the atmosphere. Finely pulverized copal exposed to the air at 212° and left at this temperature for three days in a current of air, was found to contain 76·54 C. Perfectly white copal powder, taken from a piece which had served for one of the above analyses, was exposed for three months in a drying furnace; it was then less white, and contained

Carbon . . . . .	77·05	77·34
Hydrogen . . . . .	10·06	10·11
Oxygen . . . . .	12·89	12·55

It seems therefore as if the pure, white, hard copal absorbed oxygen somewhat slower in the atmosphere than the yellow. The author obtained from Durosier a sample of the so-called *soluble copal*, which dissolves without residue in alcohol and æther, and had been prepared by triturating the Indian copal with hot water to an impalpable powder, which was suspended, decanted, and left to subside: when this powder is preserved in tin cases to



which the air has easy access, it becomes at last entirely soluble. From this it would seem that the alteration of the copal by oxidation can also take place at the common temperature, if it be in a state of fine division. This soluble copal serves as well for varnishes as the unaltered kind, and has, moreover, the advantage of affording perfectly clear and colourless solutions even in the cold. It consists of

Carbon .....	71.42	71.34
Hydrogen .....	9.24	9.22
Oxygen .....	19.34	19.44

The above-mentioned sample of copal, which had been kept for three days at  $212^{\circ}$ , was also found to have become, after a month, almost wholly soluble in alcohol, and entirely in alcohol containing æther or spirits of turpentine; it contained only 73 per cent. carbon. When Durosier's soluble copal is acted upon with alcohol of various degrees of concentration, it is also found to consist of several resins; some however of those which occur in the common copal have disappeared. On triturating copal with water (by which the oxidation, or becoming soluble, seems to be facilitated\*), not a perceptible trace of a soluble substance is taken up by the water.

The author did not examine more closely into the change which copal undergoes from being melted, by which it is rendered soluble in alcohol. It is, however, remarkable that fused copal, when treated at once with much cold alcohol or cold oil of turpentine, does not dissolve, but coagulates. No change seems to have taken place in the elementary composition.

The ordinary Indian copal never dissolves entirely, if it has not undergone some change in its constitution. Alcohol of 0.895 spec. grav. only takes up a portion of it, and absolute alcohol then dissolves from the residue a resin entirely different from the former. The copal swells in æther to a transparent gelatinous body; but the author could not, any more than Berzelius, cause the swelled portion to dissolve entirely by applying heat to it: it might perhaps take place if it were left for some time to the atmosphere. It is known, moreover, that the solution of the insoluble portion may be effected in part through the agency of the soluble portion; however, the author never observed so complete a solution of the Indian copal in alcohol as described by Unverdorben with respect to the so-called African copal. Oil of turpentine, oil of lavender, and oil of rosemary also form a swollen gelatinous substance with copal, which, however, is not more soluble.

When pulverized Indian copal is treated with ammonia no gelatinization takes place, even when heat is applied, which, however, occurs immediately if hot alcohol be then added. The gelatinous body which forms is very fine; on filtration a clear liquid passes through which contains much resin in solution, but the gelatine remains undissolved on the filter. These results are almost in contradiction to

\* Sandarach powder likewise becomes more easily soluble after having been washed with water.



those obtained by Berzelius. Caustic potash does not dissolve the Indian copal in the cold; on boiling, a spongy coagulum which swims upon the surface is formed, that cannot be made to dissolve by boiling for several days: only about 1 per cent. of the whole copal becomes dissolved. This experiment was made with dilute and concentrated caustic potash with the same result. The mass on drying possessed towards the end of the operation a smell of copaiva balsam, which was also observed by Berzelius. The combination of the soluble copal resin with potash is soluble in water, but is immediately precipitated by an excess of alkali.

Concentrated sulphuric acid blackens the copal powder with evolution of heat and disengagement of some sulphurous acid: the acid takes up some resin which can be thrown down by water, but a complete solution does not result. Nitric acid in great excess dissolves a part of the copal in the cold; when heat is employed decomposition ensues, and a perfect solution is formed.

The only certain method of obtaining a complete solution of copal, is fusing the copal and pouring over it boiling alcohol or very hot spirits of turpentine. These experiments confirm, therefore, in general, the complex nature of the natural resins of several combinations, which vary in the amount of their oxygen, and of which those containing the larger quantity of that element are the most soluble; and also show that a transition of the insoluble resins into soluble ones may occur by oxidation in the atmosphere; on which account it is necessary, in analysing resins, to avoid the action of water and air as much as possible, if it be desirable to obtain the constituents actually in the same state in which they were present.

[The conclusion in our next.]

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## ANALYTICAL CHEMISTRY.

*On a Method of detecting Sulphurous Acid in the Products of Commerce.* By MM. FORDOS and GELIS.

THE smell of sulphurous acid is so characteristic, that it may appear scarcely necessary to advance new methods for detecting its presence; but it must be observed with regard to this character, which is excellent in most cases, that it is of no use whatsoever when the sulphurous acid is mixed with substances also possessed of odour.

The presence of sulphurous acid, however, in some products employed either in medicine or in the arts, frequently occasions great inconvenience, and renders the possession of easy means of detecting and of avoiding it of some value. In 1836 M. Girardin described a method of detecting sulphurous acid in the hydrochloric acid of commerce, which is of easy execution. About 16 grs. of the acid to be tested are brought into a glass, and from 8 to 12 grs. of a perfectly white tin salt, unaltered by the air, added, upon which twice or thrice the amount of distilled water is poured on to the mixture,



and the whole well-shaken. When the hydrochloric acid contains sulphurous acid in considerable quantity, immediately on the addition of the tin salt the acid becomes turbid and yellow; and on the addition of the distilled water the smell of sulphuretted hydrogen is very evident, the liquid assumes a brownish tint, and deposits a powder of the same colour.

This process suffices in most cases; when, however, only a small quantity of sulphurous acid is present, which nevertheless may be injurious in certain operations, as for instance in toxicological researches, or in the manufacture of gaseous waters, it is of no service. The authors advise, in such cases, the following method, which is very sensitive. In presence of hydrogen in *statu nascenti*, the reduction of the sulphurous acid inevitably ensues, however small the quantity may be; hydrosulphuric acid is always formed, and the action of this body on salts of lead is so characteristic that the most minute traces of this gas are easily detected. The mode of operation presents no difficulty; some fragments of pure zinc are conveyed into a small flask, and the substance to be examined then added. If the acid is one capable of furnishing hydrogen with the zinc, it is only necessary to convey the gas which is liberated into a solution of the subacetate of lead; if the substance is not an acid, it is first mixed with sulphuric acid diluted with four or five times its volume of water, the mixture transferred into a flask, and the gas collected in the same manner. The most simple apparatus suffices—a small test tube and a curved piece of glass tubing. When the substance contains sulphurous acid, sulphuretted hydrogen is formed, and then sulphuret of lead, which is so insoluble that the least trace imparts a dark colour to the solution.

To give an idea of the sensibility of this process, a solution of sulphurous acid in water was prepared containing exactly its volume of gas. From 45 to 50 drops of this solution, mixed with 15 grammes of hydrochloric acid, were necessary in order to obtain the reactions described by M. Girardin; while one drop only of this mixture, containing about one-eighth of a cube centimetre of sulphurous acid gas, mixed with 15 grs. of dilute acid, afforded a very perceptible colouring of the acetate of lead.

This method will prove of great value in qualitative analysis, but it will also be found useful in quantitative analysis, since when the sulphurous acid exists in a concentrated state in the liquids under examination, a deposit of sulphur is always the first effect resulting from the contact of the two gases, and is accompanied by an evolution of sulphuretted hydrogen.

The following manipulation for determining the amount of hydrochloric acid and sulphurous acid in a mixture of the two gases, described by Berthollet in 1789, is said to afford good results:—Into a bell-glass containing the mixture of the gases, sufficient water is introduced to absorb both, upon which some grammes of finely divided iron are added to the solution. The reaction said to take place was, that the sulphurous acid dissolved the iron without liberating any gas; the hydrochloric acid, on the contrary, formed



chloride of iron, abandoning its hydrogen, which might be measured; and as hydrochloric acid contains half its volume of hydrogen, by doubling the volume obtained the amount of hydrochloric acid would be found, and that of the sulphurous acid by the difference. But quite different results are obtained. Thus when certain proportions are taken, for instance,

55 volumes of hydrochloric acid gas,

18 volumes of sulphurous acid gas,

no gas is liberated, protochloride of iron is formed, which dissolves in the liquid, sulphur is deposited, and after a certain time combines with the excess of iron contained in the vessel.

The process above described detects, in the most certain manner, the presence or absence of sulphurous acid, but it does not indicate whether the acid pre-existed in the substance examined, or whether it was derived from the decomposition of some other oxygenized compound of sulphur. Other and more complicated processes must in such case be had recourse to, which will form the subject of a subsequent communication.—*Journ. de Pharm.*, Feb. 1843.

### *Test for Soda.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

GENTLEMEN,

In the 'Comptes Rendus' for Jan. 23 of this year, M. Fremy proposes the antimoniate of potash as a test for soda. He states that he is able to detect  $\frac{1}{350}$  of soda by this means. From some experiments I have made on this subject, I find both the antimoniate and antimonite of potassa give a precipitate in solution of soda, which is exactly similar to that of tartaric acid with salts of potassa; falling after a few seconds if the solution be dilute, but directly if it be concentrated. The *antimonite* of potassa is the most *distinct*, the precipitate forming instantly. The antimoniate may be made by fusing 5 parts of nitrate of potassa with 1 of antimony, or its sulphuret; washing the mass thoroughly with cold water, then boiling the remaining salt for a few minutes in distilled water, and concentrating by evaporation.

The antimonite may be prepared by fusing  $\text{Sb O}^4$  with  $\text{K O} + \text{C O}^2$ , and boiling the resulting mass in distilled water: this does not require concentration.

I remain, &c.,

March 11, 1843.

J. WONFOR.

## PHARMACOLOGY.

### *The Unseasonable Collection of Vegetable Remedies.*

VEGETABLE physiology has demonstrated that, during the progress of vegetation, most remarkable changes occur in succession, in the chemical composition, as well as in the sensible qualities of a plant. Take, as an example, the aromatic and spicy qualities of the unex-



panded flowers of the *Caryophyllus aromaticus* (cloves), the flower-bud of which, if it be fully developed, loses these properties altogether, and the fruit of the tree is not in the least degree aromatic. So the berries of pimento, when they come to maturity, lose their aromatic warmth, and acquire a flavour very analogous to that of juniper. The *Colchicum autumnale* may be adduced as another example, in which the medicinal properties of the vegetable are entirely changed during the natural progress of its development. To secure the virtues of *Valerian*, its roots should be dug up in autumn when the leaves begin to decay. The root of the *Taraxacum* should be taken up in April; at any other season its virtues are questionable. The root of *Hyoscyamus*, which some persons have considered as the most active part of the plant, is all but inert in the spring; the juice of 3 lbs of the root, collected near the end of April, when the plant had hardly begun to shoot, killed a dog in somewhat less than two days, while a decoction of  $1\frac{1}{2}$  oz. from the root, collected on the last day of June, proved fatal in  $2\frac{1}{2}$  hours. Experience has also shown that, in the bark of the oak, the quantity of tannic acid varies considerably according to the season; thus, that cut in spring contains, according to Beguin\*, four times more of the astringent principle than that which is obtained in winter. The medicinal powers of *inspissated juices* are greatly controlled both by soil and season. Dr. Fothergill says, "I know, from repeated experiments, that the extract which has been prepared from *hemlock*, before the plant arrives at maturity, is much inferior to that which is made when the plant has acquired its full vigour, and is rather on the verge of decline: just when the flowers fade, the rudiments of the seeds become observable, and the habit of the plant inclines to yellow, *is the proper time* to collect it." The lettuce, when young, scarcely possesses any narcotic property; and in the poppy the narcotic principle is not apparent until the petals fall and the germen enlarges.

The leaves of *Digitalis* should be gathered just before, or during the period of inflorescence; and those of *Hyoscyamus* when the plant is in full flower, and not until the second year of its duration. Great attention should be paid to such rules, and wild and native plants should always be preferred to cultivated specimens.—Dr. Paris's *Pharmacologia*, 9th edit. 1843.

### On Copal.

M. Perottet confirms from autopsy that *Hymenæa verrucosa* (*Trachylobium Hornemannianum*, Hayne), which grows wild on Madagascar and perhaps also on the opposite coasts of Africa, and which already Commerson and Gærtner have described, which Guibourt and Martius have likewise enumerated as copal plant, and from which the beautiful clear pieces of copal enclosing papilionaceous blossoms are derived, is the mother-plant of the copal of Madagascar, and probably of all the East Indian copal; for according to the statement of East Indian merchants the copal which is exported from the East

\* Philosophical Transactions, 1799.



Indies to Europe is not collected in the Indies but is brought to the East Indian markets by Arabian traders from Mascate and Zinzibar. These people are said to collect it on the coasts of Africa and on Madagascar. So much is certain, that the mother-plant of the so-called West Indian copal, *Hymenæa courbaril*, has hitherto neither been observed in the East Indies, nor in Africa, nor in the neighbouring islands; *H. verrucosa* likewise does not occur in the East Indies. If there actually is an East Indian copal it must be derived from some other tree. Perottet has also observed the *Hewdelotia Africana*, Rich., the true mother-plant of the *Bdellium*, on high and barren localities on the banks of the Senegal, and in other parts of Western Africa; it seems, however, that the *Bdellium* which occurs in commerce is collected more in the high lands of the interior of Western Africa, in the same way as Arabian gum.—*Journ. de Pharm.*, 1842, p. 406.

Copal is found upon the coast of Africa. There are no trees in the vicinity, nor anything to indicate that there ever were any. It is found a few inches below the ground, in beds resembling lava. The natives who gather it can give no account of its origin. When taken from the bed, the gum is covered with a black earthy substance, which nothing can remove but the strongest lye. As the only establishment known to exist for cleansing it is at Salem, Massachusetts, all the gum brought to this country is sent there. It is placed in vast vats, into which strong lye is poured; and after remaining there some days, it is removed, spread upon boards, and dried in the sun. The action of a stiff brush then removes the coating, and renders it fit for use. It is then assorted, the clear (which is the first quality) separated from the dark and the spotted, and it is then packed in boxes and sent to all parts of the world.

By removing the native coating, the gum is left with a pale gold colour; but by cutting with a knife through the second coating, a brilliant surface is presented, that nearly equals the brilliancy of precious stones. In many pieces of gum insects are found, large, perfect and beautiful; also fluids, some transparent, some coloured.—Silliman's *American Journal*, Jan. 1843.

#### *On the Adulterations of Opium.*

An Armenian, who has been engaged for a great number of years in cultivating the poppy and extracting the opium, related to M. Landerer that one of the adulterations of opium consisted in mixing it in the soft and fresh state with well-crushed grapes, and from which the stones had been removed. He assured him that not a single cake of opium came from the East without having first undergone this adulteration.

Another adulteration consists in triturating in a stone mortar the epidermis of the capsule, and of the stalks of the poppy, with white of egg, and incorporating this mixture in certain proportions with the opium.



## CHEMICAL PREPARATIONS.

*On the Preparation of the Officinal Oxide of Antimony.*

*By M. DURAND.*

THE author had occasion to observe that the oxide of antimony employed internally had sometimes an emetic action which it ought not to possess, sometimes not. He ascertained by experiment that the oxide of antimony which induced the above effect, had always been prepared, according to the method of the French Codex\*, from algaroth powder by means of carbonate of soda, and that an oxide prepared from tartar emetic never had any such effect. It was soon evident that the emetic action of all oxide of antimony prepared from the powder of algaroth or the protochloride of antimony, was owing to the preparation containing chloride of antimony. This induced the author to discard entirely the method of the 'Codex,' which had been hitherto considered as the best mode of preparing the oxide of antimony, and at least far preferable to that adopted in the 'Pharm. Borussica,' and to require that the officinal oxide of antimony be prepared only from properly purified and crystallized tartar emetic. The best method of doing this is to precipitate a boiling hot solution of tartar emetic in 10 parts water with an excess of caustic ammonia, heating the liquid with the precipitate for a short time, leaving it to subside, and then decanting and edulcorating the precipitate as long as the water that passes through has an alkaline reaction. In this manner about 40 per cent. of oxide of antimony is obtained from the tartar emetic, so that only 4 per cent. are lost. According to the author's experiments, only the half of the oxide of antimony contained in the tartar emetic is thrown down by carbonate of soda, so that even though the precipitation is effected easily at a boiling heat, and the precipitate is quickly deposited, this method cannot be recommended.

The preparation made in the above manner can naturally contain no chlorine; yet, as Bussy has correctly observed, the author is greatly mistaken in regarding the impurification of the oxide of antimony by chlorine as inseparable from the method of the 'Codex;' it only occurs when the preparation has not been well edulcorated, and the method of the 'Codex' retains its value when that has been attended to.—*Journ. der Pharm.*, p. 364, 1842.

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It will not be amiss in this place to direct attention to the method recommended by Liebig in his 'Handwörterbuch' for preparing the oxide of antimony. It is as follows:—3 parts of pure, very finely pulverized metallic antimony are digested in a porcelain dish with 7 parts of the hydrate of sulphuric acid ( $\text{SO}_3 + \text{aq}$ ), until all metallic particles have disappeared. The antimony is oxidized under evolution of sulphurous acid to neutral sulphate of antimony. The white mass of salt is treated with cold, and finally with boiling

\* This is identical in principle with the directions of the London, Edinburgh and Dublin Pharmacopœias.—En.



water, and the insoluble residue of basic sulphate of antimony is digested with carbonate of soda or potash. The well-washed residue is pure oxide of antimony, or at the furthest, when oxidation has not been complete, mixed only with some few particles of metallic antimony. The first waters contain some oxide of antimony, but so little that it is not worth while precipitating it with alkalies.

*Preparation of Hydrargyrum aceticum. By M. CERUTTI.*

The 'Pharmacopœia Borussica' directs the *Hydrarg. acet.* to be prepared from the *Liq. Hydrarg. nitr. oxydulati*. In this case it is necessary for the chemist to examine carefully the *Liq. Hydrarg. nitr. oxydul.* before employing it for this preparation, as to its specific gravity, and also to ascertain whether the mercury is actually contained in it in the state of protoxide. When this liquid is diluted according to the 'Pharmacopœia' with four parts of distilled water, and mixed with a solution of acetate of potash or soda (in which case, should a turbidness or precipitate have been occasioned, a few drops of pure nitric acid must be added to it), the crystalline precipitate is so inconsiderable that a great portion of the preparation must have remained dissolved in the liquid, and cannot be obtained by evaporation and crystallization, since in this manner it is rendered impure by nitrate of potash or soda. To obtain a pure and beautiful preparation, I have therefore adopted the following process:—2 parts of crystallized protonitrate of mercury are pulverized in a porcelain mortar, and during trituration some (27 drops) pure nitric acid added, upon which it is dissolved in 12 parts of hot distilled water. After cooling and filtration the specific gravity is about 1.100. 2 parts crystallized acetate of potash or soda are dissolved in 12 parts distilled water, and after cooling filtered, upon which the solutions are mixed warm. The mixture immediately acquires a blackish gray colour, which on cooling changes into a dirty white gray. After subsidence the liquid is poured off, and the silvery white flexible scales, which have a slightly metallic taste, collected upon the filter, washed with distilled water, and then dried between blotting-paper.—*Pharm. Central Blatt.*, Feb. 8, 1843.

*On the Preparation of Calomel.*

In the 'Journal de Pharmacie' for February, Mr. Calvert states, that the method described by M. Soubeiran, described at page 210 of this Journal, is identical with that employed in many of the manufacturing houses of this country. He states the apparatus employed in England to consist of an iron cylinder 75 centimetres in length and 30 in diameter, which is closed at one extremity by a door similar to those used in the manufacture of hydrochloric acid, and through which the necessary materials are inserted. The other extremity of the tube has a kind of neck attached to it 15 centimetres in length and 15 in breadth. The great breadth is in order to avoid any obstructions by the condensation of the vapour of the calomel.



We have received a letter in connexion with this subject from a correspondent signing himself a Member of the Pharmaceutical Society and a Subscriber to this Journal, requesting information on the following point:—"In your Number for Feb. 15 it is said that orpiment and vermilion *undergo change from contact* with the air at a high temperature, while in the 'Pharmaceutical Journal' for the 1st of March, the version is, that the operation presents difficulties in the cases of orpiment and cinnabar, arising from the substances *requiring* the contact of air at a high temperature." In answer to this question, we subjoin the original French: "L'opération ne présente de difficultés que pour celles qui, telle que l'orpiment et le cinabre, *éprouvent une altération par le contact* de l'air à une haute température." At the same time we may add, that a person at all acquainted with chemistry must be aware that these sulphurets, on being sublimed, are liable to decomposition from the sulphur, &c. being oxidized by the oxygen of the air, the presence of which, therefore, far from being requisite, is not even desirable.—ED.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *Manufacture of Vinegar.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

GENTLEMEN,

FROM the article contained in your Seventh Number, "On the Manufacture of Vinegar by the New or Quick Method," you do not appear to be aware of what is going on *at home*; and as a little information on that point might be interesting to some of your readers, especially those who have a due and proper respect for *native* talent, I beg to place at your disposal the following particulars.

For some years there have been four of the largest country manufactories in the kingdom at work on my father's improvement, which was patented in October 1824, and which are now competing most successfully and profitably with the London houses.

The apparatus consists of a large vat, in the centre of which is placed a revolving pump, having two or more shoots pierced with holes, so as to cause a constant shower of wash (fermented wort) to descend from the top; the lower portion of this vat is charged with wash, the upper with birch twigs, properly prepared, and as high as possible, so as not to interfere with the revolution of the shoots; between the surface of the wash and the joists which support the birch a space of 3 or 4 inches is allowed, and one or more holes made in the vat for the admission of air, either direct from the atmosphere or forced in. The wash being heated by steam-pipes to between 90° and 100°, and the pump kept in motion, a charge may be acidified in from 48 hours to 48 days, dependent on the relative proportion of wash and birch. In practice, however, we find that the most economical arrangement is, so to adapt the apparatus that



a perfect acidification may be obtained in about 15 or 20 days—the season and state of the atmosphere making all that difference, other circumstances being the same.

The advantages of this apparatus, independent of its rapidity, are,

1. That a wort brewed from raw grain, with a small proportion of malt (about a sixth or seventh), will make a vinegar *quite equal in every respect* to that brewed from malt alone.

2. That the process of acidification is so completely under control, that it may be stopped the moment it has arrived at a maximum, thus preventing the defect of mixing that which has *not* arrived at that point, and that which has gone *beyond* it, viz. the first stage of putrefaction, so common, and which it is almost impossible to remedy in the old process.

3. The amount of air admitted can be so nicely adjusted as to prevent the loss of alcohol, or the formation of aldehyde\*; at all events, should any derangements of that nature occur, they can easily be detected and remedied.

In order to give you some idea of the advantages and economy of the practical use of this apparatus, I will just state, that a wort brewed at 24 lbs. gravity per Richardson, or 1066 specific gravity, will yield, with proper management, an acid equal to, and sometimes above proof per the revenue acetometer, or, by a less equivocal test, the corresponding proportion of crystallized subcarbonate of soda.

Should any of your readers wish for further particulars, I shall be most happy to answer any query consistent with my own interest, either privately or through the medium of your highly-promising and valuable ‘Gazette.’

Norwich, 15th Feb. 1843.

F. HAM.

We are much obliged to our correspondent for his communication, but we think he has mistaken the object of our article on the Quick Process, which was merely to describe the *principle* or theory of the process, and not to discuss the various methods and apparatus employed either in this country or abroad. He will even find in the preceding Number, at p. 167, the description of a process patented in this country, which is nothing more than a slight modification of the Quick Process of the Germans. We are sorry that want of proper respect for *native talent* should be imputed to us, for the very object of this Journal is to protect and further it.

With respect to aldehyde not being formed before the acetic acid, but rather resulting from a deoxidation of it, we must state that all experiments, of which there are not a few, are entirely opposed to

\* In the conversion of alcohol into acetic acid, *with a full complement of air or oxygen*, I rather question the formation of aldehyde at all as a distinct and isolated compound, but am inclined to consider that alcohol passes at once into acetic acid; the intermediate state of aldehyde arising either from a deficiency of oxygen, or a deoxidation of the acetic acid already formed by the remaining alcohol. This latter phenomenon, I have reason to believe, frequently occurs with some manufacturers.



any such view, and, in fact, we are not acquainted with any means of reducing acetic acid to the state of aldehyde, which, if formed in the way described in the above note, would be one of the most easy things in the world.—ED.

*On the Indigo Test.* By HENRY SCHLUMBERGER.

In the following memoir it is my intention to communicate the process and the results of an indigo test which I have employed to determine accurately the value of various kinds of indigo.

In general this test consists in dissolving the indigo in fuming sulphuric acid, and decolorizing the solution which has been diluted with much water by means of chloride of lime, as this acts only on the blue colouring substance, and not at the same time on the various other bodies which indigo contains. The quantity of chloride of lime requisite to produce decolorization agrees, as will be subsequently seen, accurately with the amount of colouring matter.

The operations in this experiment are as follows:—I prepare, in the first place, a portion of pure indigo or indigo-blue by removing the scum which is continually formed on the bath or vat blue, deoxidized by lime and green vitriol, treating it with an excess of dilute hydrochloric acid, washing the deposit until all soluble parts have been removed, then drying it and preserving the indigo in well-closed bottles, in order to protect it from all changes in the moist state. When no blue vats are at hand, a mixture is made of 3 parts burnt and slaked lime, 3 parts green vitriol, 1 part of indigo rubbed fine with water, and 50 parts water. These are stirred for some hours frequently and left to subside, so that the clear liquid may be poured off, which is then violently agitated with a broom, in order to bring it into contact with the atmosphere, until the whole of the indigo has become oxidized and thrown down. The precipitate obtained is treated with dilute hydrochloric acid in the same manner as is described for the vat blue. In all my experiments this pure indigo serves as a standard, and for comparison with the results which the various kinds of indigo submitted to the test afford. Suppose the quantity of colouring matter in the pure indigo to be 100°, I express the value of the tested indigo by numbers which indicate the per-centage of pure colouring matter. In each experiment I employ the standard indigo for comparison with that of commerce, as it is then not requisite to determine previously the amount of chloride of lime in solution, besides which the experiment is more accurate. In this case the causes of the differences in the results depend on circumstances, which always remain the same whether the standard indigo is employed, or the indigo, the degree of purity of which is to be ascertained. 1 gramme of each kind of indigo is weighed off, which must be pulverized and finely ground. This is brought into a dish of about 8 centimetres in diameter, and 12 grammes of fuming sulphuric acid added to it by means of a pipette graduated for this quantity. This mixture is now rubbed together, the dish



placed for four hours at a temperature of from  $122^{\circ}$  to  $140^{\circ}$ ; or what is far better for the accuracy of the experiment, it is transferred well-covered to a place in which the temperature is about  $68^{\circ}$  to  $78^{\circ}$ .

Meantime so many glasses, containing about a quart, are filled with distilled water as there are sulphate solutions, and to each solution of indigo is added its equal volume of water from the glass. The liquid becomes warm, upon which they are rubbed again; water is then gradually added until the dish is full, when the whole is poured into the glass, and the dish washed with a portion of the water. Hereupon a solution of chloride of lime is prepared of  $1^{\circ}$  Baumé in strength, and a pipette taken which is divided into 3 or 4 millimetres.

The well-stirred blue solution of the sulphate of indigo is now measured in a tube divided into  $100^{\circ}$ , similar to Descroizilles' alkalimeter, and a portion poured into a dish, well-stirred, and the entire quantity of the chloride of lime contained in the measure added at once. If the liquid immediately assumes a yellow colour, it is a sign of an excess of chloride of lime, and now sulphate of indigo is added by degrees until a faint olive green colouring has been obtained. The experiment is now repeated, and the quantity of chloride of lime which had been found necessary in the first case, added to the quantity of sulphate of indigo; so that with one single mixing, there being neither an excess of chloride of lime or of sulphate of indigo, the liquid acquires that tint at once. But when, after the first mixture, the liquid has retained a blue colour, which is a sign of an excess of the sulphate of indigo, fewer degrees of it are taken until the requisite tint has likewise been attained with a single mixing.

When the several indigos have been treated in this manner, the following calculation is made to obtain the true value of the indigo which has been examined; the goodness of the indigo is in inverse ratio to the quantity of sulphate of indigo employed in decolorizing.

Let  $P$  be the number of the degrees which were requisite to decolorize the pure sulphate of indigo, and  $C$  the number of the degrees which were employed for the same purpose with the commercial indigo; we then obtain the proportion  $C : P :: 100 : x$ , in which

case  $\frac{100 \times P}{C} = x$ , or equal to the number sought for of the degree

employed in the experiment, or equal to the quantity of pure colouring matter which 100 parts of the indigo employed for the test contained.

Suppose, for instance, it were found that pure indigo required 54 parts of its sulphate solution to be decolorized by the fixed quantity of chloride of lime, and that, on the other hand, the indigo under examination required 64 parts of its sulphate solution, then

according to the proportion  $64 : 54 = 100 : x$ ,  $\frac{100 \times 54}{64} = x$ , or equal

to 84.5, which indicates the quantity of indigo-blue contained in 100 parts of the indigo examined.



It is important for the accuracy of the experiment that the pure indigo, and the kinds of indigo submitted to the test, should be equally moist, and it is therefore requisite to inclose all the samples as soon as they are taken out of the chests in glass vials, to prevent any attraction of moisture or desiccation previous to weighing. When a chest contains several kinds of indigo which exhibit slight differences in their tints, some pieces are selected which are separated into several lots, these are then powdered together, and the mean result taken as the correct one. But when, as often happens, a chest contains pieces of indigo of entirely different tints, it is best to examine the mixed sorts separately.

In all my experiments and tests I have hitherto used only 12 parts of sulphuric acid to 1 of indigo for its solution. It might perhaps be more advantageous to employ a larger quantity, say 15 parts acid, in order to prevent completely, and under all circumstances, the formation of phœnicine-sulphuric acid, or of indigo-purple; and to convert the whole of the blue colouring substance into indigo-sulphuric acid. In this operation, therefore, it is very important that the mixture consisting of indigo and sulphuric acid should be well ground in order to obtain a complete solution of the indigo.

I also dilute the solution both of the sulphate of indigo and of that of the chloride of lime, since the experiment in this manner is less exposed to error than with concentrated solutions. Besides, it is easier when the liquid is only faint blue to distinguish the degree of decolorization, when it must be discontinued.

Impure water, or such as contains salts of lime, produces a more or less considerable precipitate of the blue colouring substance mixed with sulphate of indigo; it is therefore necessary to employ rain or distilled water.

The last stage of decolorization, or the point at which it is best to discontinue it, is the more easily ascertained, the purer the indigo, and the more complete its solution; and in this case it is evident how sensitive the reaction of the chloride of lime is on the indigo; for a yellow solution of indigo, to which chloride of lime has been added, in which therefore there is an excess of chloride of lime, is rendered blue by a single degree of the indigo solution, a proof that this method will indicate a half per cent. In the commercial kinds of indigo it is less easy to fix the point at which decolorization must be discontinued, for in this case the decolorized liquid assumes an olive colour, and from 2° to 3° of the indigo solution must be added to change the yellow colour into the blue.

I have preferred the method of taking a fixed quantity of the chloride of lime and varying that of the sulphate of indigo, to that of making the sulphate of indigo a fixed quantity, and allowing the decolorizing agent to be diminished or increased, from its being possible to dilute the indigo solution with much water, which has the advantage of rendering the degrees greater.

Chevreur, in his '*Lectures on Chemistry applied to Dyeing*,' has, among several methods of examining the commercial indigo, also proposed that of dissolving the indigo in sulphuric acid, and deco-



lorizing the blue solution by means of chloride of lime; but Chevreul conceived that this method, although easy of execution, could not afford absolute results, and that in order to ascertain the value of the indigo with certainty, it was necessary to check the one experiment by another.

Before I adopted the above-described method of testing the indigo, I was necessarily obliged to ascertain its accuracy by several experiments, which afforded results far more favourable than I had expected. For this purpose I took vat blues with purified indigo at  $100^{\circ}$ , indigo from Java after determination with chloride of lime at  $84^{\circ}3$ , and indigo of Caracas at  $56^{\circ}$ . I allowed 1 gramme of each of the three kinds of indigo to deoxidize and dissolve in 3 grs. green vitriol, 3 grs. unburnt lime, and 1000 grs. water. The colouring of small cotton samples in these baths exhibited tints of great difference as to intensity, which appeared to be in proportion with the amount previously ascertained by the test with chloride of lime. In like manner I obtained colours of exact similarity with reference to intensity, when I diluted these baths with more or less water, in proportion to their purity and richness in colouring matter, as ascertained by the test with chloride of lime. The bath with pure indigo contained, for instance, 1756 grs. water, that with indigo from Java 1506 grs., and that with indigo from Caracas remained with 1000 grs., so that the various quantities of water were in the same proportions as the degrees of purity of the several kinds of indigo, viz.  $100 : 84\cdot3 : 56$ . Each of these baths contained, therefore, 1756 grs. water for each degree of indigo-blue.

On deoxidizing and dissolving 5 grs. Javanese indigo of  $84^{\circ}3$  of purity, also 5 grs. indigo of Caracas of  $56^{\circ}$ , by means of alkali, green vitriol, and water, again oxidizing the clear liquid by a current of air, treating the precipitated colouring substance with dilute hydrochloric acid, washing it with water, and then drying it, I obtained from the Java indigo 3.5 grs. indigo-blue, and from the indigo from Caracas 2.23 grs. indigo-blue. Although the residue of iron was well-washed with water which had been made alkaline with caustic potash, it nevertheless contained a large quantity of indigo. Treated with hydrochloric acid these residues lost a great portion of their oxide of iron, and the sediments remaining containing indigo were again treated with caustic potash and green vitriol; from this new solution the indigo-blue was precipitated, and amounted, after having been treated in the manner above described, in the Java indigo to 0.44 gr., and in that from Caracas to 0.36 gr. colouring substance. The residue of iron from this second deoxidation still contained a portion of indigo-blue, which, however, was not attended to.

If we add together the indigo-blue obtained by these two operations, we obtain for the Java indigo 3.94 grs., which correspond to 78.6 per cent. indigo-blue; if the colouring substance which remains in the last iron residue is taken into account, it will approach very near to the  $84^{\circ}3$  pure colouring matter, which had been found by the experiment with chloride of lime. A similar result was obtained



from the experiments with 5 grs. Caracas at  $56^{\circ}$ ; these afforded in the two processes of deoxidation 2.59 grs. indigo-blue, which correspond to 51.8 per cent. This number also approaches to that found with chloride of lime; and, moreover, the indigo-blue remaining with the iron residue should also be taken into account.

I also made an experiment which afforded the most decisive proof of the accuracy and certainty of my test. For this purpose I took 5 grs. Java indigo at  $84^{\circ}3$ , determined by the chlorine test; it was pulverized and boiled till all soluble parts were removed. The insoluble residue was repeatedly treated with boiling alcohol, which immediately became of a purple colour, and this was continued so long as the alcohol appeared coloured. This residue, insoluble in alcohol, was treated with dilute hydrochloric acid, and then boiled a second time with alcohol, it gave on drying 4.31 grs. indigo-blue, which correspond to 86.2 per cent., which approach very closely to the  $84^{\circ}3$  per cent. found with the chlorine test.

## PROCEEDINGS OF SOCIETIES.

### *Meeting of the Royal Institution.*

Friday, Feb. 17, 1843.

MR. FOWNES lectured "On the Functions of Nutrition in Animals."

The bodies of animals were described as made up of elements with which the chemist is familiar, but that, in consequence of their union with the mysterious principle which we call *life*, they suffer much modification, and are not so easily studied as is mere inorganic matter. The three great constituents of animal matter—albumen, fibrine, and casein—were severally described. The first was contained in white of egg, and obtained as a precipitate from solution in acetic acid, by adding water; the second, obtained in a white stringy form by whipping blood with twigs; and the third is found in milk only, and developed by adding rennet. They all exist in soluble as well as in insoluble states; they may change into each other, and are all composed of the same elements, carbon, hydrogen, nitrogen, oxygen, sulphur, and phosphorus; and each appears to possess the same quantity of the four first named, but to vary in the quantity of the last two. Experiments were introduced in illustration of this similarity of constitution. The blood was then described as the food or source whence the supply of these materials was drawn; and in reference to its red hue, and to the iron it contains, which is the cause of this hue, the lecturer said that the use of this metal in the animal economy has been long a mystery; but that M. Liebig very ingeniously considers it to be the vehicle whereby oxygen is carried from the lungs to every part of the system. He reasons thus:—The arterial blood, in consequence of its having entered the lungs, becomes supplied with oxygen, and assumes the characteristic bright colour; this is due to the *per-oxide* of iron; as it reaches the capillaries a



portion of the oxygen unites with the carbon of the system, forming carbonic acid, and literally, by a slow combustion, burning away the old material to give place for the new; and the iron, in the form of *prot-oxide*, remains, giving the dark character to the venous blood. We can readily see the source whence the blood of carnivorous animals obtains the three constituents, for they are part and parcel of the very flesh they eat; but they are not so manifest in the food of herbivorous creatures. However, a very simple process enables the chemist to obtain from grain the very fibrine found in blood; from vegetable juices the very albumen found in egg; and from beans the very caseine found in milk. The difference of opinion now existing between Liebig and Dumas, relative to the origin of fat, was alluded to,—the one thinking that animals fed on meal develop more fat than can be accounted for in the food they have eaten; the other thinking they do not. The consumption of material was stated to be in proportion to the amount of nervous energy developed; but how the two are linked as cause and effect it is impossible to determine. The quiet, easy man becomes fat, but deep-thinking or active men remain thin: fat is, as it were, a store of fuel against contingencies; and hence, in cases of starvation, is first to disappear.—*Polytechnic Journal*.

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## REVIEWS.

*Pharmacologia; being an extended Inquiry into the Operations of Medicinal Bodies, upon which are founded the Theory and Art of Prescribing.* By J. A. PARIS, M.D. London: Highley.

FEW works that have lately issued from the press are, in our opinion, destined to meet with so favourable a reception from that portion of the public for whom they are expressly intended as the work bearing the above title, and few are so well deserving of it. A work which has already run through eight editions needs no recommendation from the press—the public have already pronounced in its favour. The present volume may however be considered as entirely new; in fact the author informs us that it has been rewritten, in order to incorporate the latest discoveries in physiology, chemistry and *materia medica*; and this was absolutely necessary; for who at all acquainted with chemistry is not aware of the immense progress which this science has made within the last few years, especially that portion which may properly be termed pharmacological chemistry? The recent investigations of Liebig have thrown great light on the chemistry of the human frame, and have drawn more closely the ties already existing between medicine and that science. It is with regret therefore we learn from the preface, that nearly the whole of this work had been printed before a copy of Liebig's '*Animal Chemistry*' reached Dr. Paris's hands, which, says the author, "will explain my silence regarding several of those theories that bear directly against opinions which I have confidently maintained." Many of Liebig's theories, it must be confessed, may appear to some more



bold and hardy than correct; and the views therefore of persons of long experience, and who from their vocation have had opportunities of witnessing the various changes in the human frame itself, must be of the greatest value, whether confirmatory of, or in contradiction to, those theories. The learned author is however most unfortunate in his selection when attacking Liebig's views relative to digestion. "Liebig," says Dr. Paris, "captivated with his theory of transformation, enlists it at once into his service to explain the phænomena of this process. He denies the existence of any distinct digestive principle, and maintains that the change which the food undergoes in the stomach is the result of induction, from the stomach itself yielding a substance in the state of transformation, with which it comes in contact: all experiment is opposed to this view." Now, in our opinion, no single theory advanced by Liebig is more likely to stand the test of time and experience than the theory of digestion; and as to its being opposed to all experiment, we do not hesitate to say that such is not the case. To enter here more fully into the discussion of this point would however lead us too far.

The work is divided into three parts. Part I. contains a general history of materia medica; Part II. the physiological and chemical action of medicinal substances; and Part III. the theory and art of prescribing. This portion is exceedingly valuable, and well deserves the attentive study of the practitioner. A synopsis of incompatibles and 189 illustrative formulæ, conclude the work, which we are certain will occupy a conspicuous place in the library of the intelligent practitioner, and of those in any way connected with the study and practice of medicine.

## PATENTS.

*Patent granted to Henry Hough Watson, Bolton-le-Moor, Lancaster, for his Invention of certain Improvements in Bleaching, changing the Colour of, and otherwise preparing, purifying and refining Tallow, and certain other organic Substances, Mixtures, Compounds and Manufactures.*

THIS invention consists in bleaching and otherwise preparing, purifying and refining tallow, wax, and such other substances as are of a greasy or oleaginous nature. The patentee claims the application of a solution of mineral chameleon or compound of manganetic or manganic acid and potash, or soda, or other alkaline or earthy base, to wax, tallow, or other greasy or oleaginous substance, in a melted, fluid, or softened state, by mixing the same therewith; and the previous or subsequent application of sulphuric acid (or other acid having a stronger affinity than the manganetic acid for the alkaline or earthy base of the chameleon) to the said mixture, for the purposes of bleaching and changing the colour of the tallow or other substance.



And he claims, for the same purposes, the application (by mixing) to melted, fluid, or softened wax, tallow, grease, or oleaginous substance of a solution or mixture formed by adding sulphuric acid, or such other acid as just alluded to, to a solution of the mineral chameleon, previously to either of them being added to the substance to be operated upon. He also claims the application of a solution (made by the aid of acid) of the red oxide or the deutoxide of manganese, or a solution containing manganese, combined with more oxygen than it has combined with it when in the state of protoxide, to melted or softened tallow, or other fluid, or softened greasy or oleaginous substance, by mixing the solution with the substance to be operated upon, for the purpose of bleaching and changing the colour of the same; and when applied to "unrendered" tallow or fat for the purpose of bleaching, changing the colour of, and otherwise preparing, purifying and refining the same. He likewise claims the application of the residuary liquor (left after the bleaching or changing the colour of prepared or rendered tallow or other substance) to unrendered tallow or fat, by heating and mixing the same therewith, for the purpose of preparing, purifying and refining the tallow or fat.

When, in bleaching or changing the colour of tallow, or other oleaginous substance, a maximum degree of whiteness is not required, and when great expedition is not an object, the patentee, instead of using the compounds before described, adds to the tallow, when in a melted or softened state, a quantity of oxide of manganese (not the protoxide) in a pulverized state. The mixture is stirred repeatedly for a few hours, and kept at a temperature of about  $150^{\circ}$ ; after which the oxide of manganese is separated by filtering, or is deposited by the mixture being allowed to stand, and, at the same time, kept warm. The tallow, or other substance, is then removed. Or, instead of this process, the patentee mixes the tallow, or other oleaginous substance, with the oxide of manganese and sulphuric acid (previously made so dilute as to be incapable of charring organic matter), and keeping the mixture at a temperature of about  $212^{\circ}$ , agitates it at intervals until the desired change of colour is produced. When the colour of the tallow, or other oleaginous substance, is found to be sufficiently changed, the agitation is discontinued, but the temperature is kept so high that the substance will remain in a fluid state till the oxide of manganese and acid have settled, and until it is sufficiently transparent; after which it may be removed for use. The oxide of manganese and acid may either be mixed together, previously to being added to the substance to be operated upon, or otherwise.—Sealed June 21, 1842.



# THE CHEMICAL GAZETTE.

No. XI.—April 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Chemical Equivalents, considered as Simple Multiples of that of Hydrogen. By M. J. PELOUZE.*

THE attention of chemists has recently been drawn to the old hypothesis of Dr. Prout, that the equivalents of all bodies without exception are multiples in whole numbers of that of hydrogen. For a long time this view only counted a few supporters in England; almost every one considered it to be merely a necessary consequence of the lightness of the hydrogen equivalent, which indeed is so great, that like every other small number it must, to within certain corrections, be contained several times entire in a large one.

The late determinations of the equivalents of carbon, hydrogen, nitrogen and calcium, which have been made with such great care by M. Dumas, tend to convert the hypothesis of the English chemist into a true law. There are indeed such simple numerical relations between these last equivalents, that they may be deduced immediately, and free from all theoretical notion, from the numerous experiments of M. Dumas. I am far from denying the correctness of any one of the results which have lately served to correct several of the equivalents, but I believe that the following observations and facts will sufficiently show that great error has been committed in ascribing generality to these relations. The method which I employed to solve this difficult question does not consist in determining again the equivalents of some elements in order to compare them with that of hydrogen, for this important point has been the subject of numerous researches of one of the most practised in analytical chemistry, M. Berzelius; and, moreover, whatever care be employed in such determinations, they all offer a certain connexion, so that a fault made in one equivalent affects several others.

To arrive at the object in view, I planned a series of infinitely more simple and strict experiments, which consist in taking well-defined oxygen compounds, which decompose by mere heating, without the intervention of any other body, and determining the amount of oxygen lost from the weight of the residue; so that, in a word, the whole experiment consists solely of two weighings and one ignition.

One of the bodies best suited for this experiment is the chlorate of potash, from its being composed of two low-numerical equivalents



being easily obtained perfectly pure. Heat decomposes it into oxygen and chloride of potassium. Leaving out of question the equivalents of chlorine and of potassium, it is only requisite to determine that of their combination, and this is evidently the atomic weight which combines with 600 parts in weight of oxygen; for chlorate of potash consists of 6 equivalents of the latter body and 1 equivalent of each of the other two.

But if chlorine and potassium are both simple multiples of hydrogen, the product of their combination, that is, the chloride of potassium, must likewise necessarily be so. The problem therefore is very simple. 100 parts chlorate of potash give, according to Berzelius, 39.15 oxygen, and leave 60.85 chloride of potassium. The results of more recent experiments of M. Marignac are almost identically the same\*, for he found 39.161 oxygen and 60.839 potassium as the mean from six experiments, always performed with very considerable quantities of chlorate of potash, in which the greatest difference amounted to 9 milligrammes oxygen for 100 grammes salt. I also have come to a similar result. 100 chlorate of potash afforded 60.843, 60.857, 60.830, or as mean 60.840 chloride of potassium, and consequently 39.160 oxygen.

We find, from these three series of experiments, the equivalent of chloride of potassium to be—

932.568 according to Berzelius,  
 932.140 according to Marignac,  
 932.175 according to my experiments,

Mean.... 932.295.

These numbers divided by 12.5 give 74.583; consequently the equivalent of chloride of potassium is neither 75 times nor 74 times that of hydrogen, but in truth 74.583. The equivalent of hydrogen multiplied by 75 affords 937.5, with 74 only 925.0. These numbers evidently differ by more than half a hundredth from those which express the equivalent of the chloride of potassium without any hypothesis, and resulting from a great number of experiments.

For this equivalent to be 75 times that of hydrogen, it must be supposed that in an operation which, as above stated, consists solely of one ignition and two weighings, an error could occur of 136 milligrammes for 100 grammes of the chlorate. Suppose the equivalent to be 74, then the error would be greater, for it must amount to 183 milligrammes. This error seems to be impossible, for not one of the experiments of Berzelius differs by more than 4 milligrammes for 100 grammes, and their coincidence with those of Marignac and of myself is as good as perfect.

The perchlorate of potash leads to the same conclusions; the equivalent 932.140 represents in this salt 46.185 oxygen to 100, and M. Marignac found 46.187. The theoretical equivalents would require 46.043 and 46.376.

The considerations briefly expounded in this note prove, if I do not err, in the most decided manner, that the hypothesis of Dr. Prout

\* Biblioth. Univers., 1842.



is incorrect, *i. e.* that the equivalents of all the simple bodies are not multiples in whole numbers of that of hydrogen. Let it be well understood I do not intend to say that the equivalent of no simple body is a simple multiple of that of hydrogen; I confine myself solely to deny the correctness of such a relation for chlorine and potassium, or more strictly for one of these two elements, as the experiments upon which I found my conclusion give only the equivalent of the combination of the two, not that of each of them. This however is perfectly irrelevant to the question, since in the hypothesis which I dispute a compound must be in the same relation as its constituents towards hydrogen.—*Comptes Rendus*, 1843.

*Action of Nitric Acid upon Strychnine and Brucine.*

By M. GERHARDT.

Pure strychnine is not immediately coloured by nitric acid; but when this acid is added in excess, and the mixture left to itself for 24 hours, it acquires a peach colour, and water precipitates from the concentrated solution a sulphur-yellow powder, which dissolves in much water to a yellow solution. Brucine is immediately coloured dark red on coming into contact with nitric acid, and a reddish-yellow body is formed, which in its chemical characters resembles that derived from the strychnine. When heated in a small tube it decomposes suddenly without detonating, and explodes without noise. Both bodies dissolve in boiling potash, and then assume a dark colour; they evidently contain the constituents of the vapour of nitrous acid.

*On the Preparation and Composition of Glycyrrhizine.*

By A. VOGEL.

It is not possible to obtain the sugar of the liquorice root absolutely free from alkali according to the usual method, from this latter not being altogether insoluble in alcohol; and if, on the other hand, a small portion of the acid compound is left undecomposed in the solution, a mixture is obtained on evaporation of pure glycyrrhizine with the sulphate, which on that account cannot be employed for elementary analysis. Glycyrrhizine, prepared in this manner constantly leaves behind on combustion a small quantity of ash; and several analyses which had been made with it afforded results agreeing so little with each other as to leave no doubt of the impurity of the body.

As glycyrrhizine forms precipitates with most of the metallic salts, for instance with nitrate of copper, neutral acetate of lead, sesquichloride of tin, &c., which are true combinations of the sugar with the oxide, the author endeavoured to separate the glycyrrhizine pure from one of its metallic compounds. To a solution which had been prepared in the usual way, by infusion of the pounded liquorice root in boiling water, a solution of basic acetate of lead was added by degrees, with the precaution that the salt did not become neutral.



The yellowish-white voluminous precipitate that formed was washed repeatedly with distilled water, then suspended in water and decomposed by means of sulphuretted hydrogen. The sugar retains the lead mechanically, so that the black precipitate of sulphuret of lead does not subside even after a long time, and the liquid passes turbid through the filter. Berzelius mentions this circumstance as an obstacle to this otherwise most certain method of obtaining glycyrrhizine perfectly free from acids and bases. The author has found that this disadvantage can be completely overcome by the application of heat; if, for instance, the combination of the glycyrrhizine with lead which has been decomposed by sulphuretted hydrogen is boiled several times, the sulphuret of lead separates entirely from the sugar, and the liquid may then be filtered perfectly clear. This is now evaporated carefully to dryness, and the residue redissolved several times in absolute alcohol. On driving off the alcohol, the glycyrrhizine remains behind in bright yellow pieces. Prepared in this manner it is free from bases and acids; and when heated in small quantity upon platinum foil, burns with a very smoky flame, but leaving no ash behind. The precipitate produced by chloride of barium in the aqueous solution of glycyrrhizine, is a combination of the sugar with barytes, and dissolves entirely in pure hydrochloric acid. In this state therefore it may be considered as free from sulphuric acid.

Glycyrrhizine is far more soluble in boiling water than in cold; it dissolves quickly and in great quantity in alcohol; it melts at 392° Fahr. to a dark brown transparent mass; it is perfectly amorphous, and even when considerably magnified does not exhibit a trace of crystallization.

On analysing it with oxide of copper it was found to have the following composition:—

C =	62·801	62·322	62·449
H =	7·621	7·638	7·667
O =	29·578	30·040	29·884
	<hr/> 100·000	<hr/> 100·000	<hr/> 100·000

The atomic weight of glycyrrhizine was determined from its combination with oxide of lead. To obtain this compound pure the author added a neutral solution of acetate of lead to one of pure glycyrrhizine; the precipitate which formed consisted in 100 parts of 58·411 sugar and 41·582 oxide of lead, affording as atomic weight the number 1958.

The composition of glycyrrhizine is best expressed by the following formula:— $C^{16} H^{12} O^6$ .

*Sulphate of Glycyrrhizine.*—In order to obtain this combination in a pure state the author dissolved pure glycyrrhizine in water, and added sulphuric acid to the solution until no more precipitate was formed. When the precipitate had entirely subsided, the supernatant liquor was decanted, the precipitate inclosed in a piece of fine linen, and beaten in water until this exhibited no longer an acid reaction. This edulcoration is effected with some loss, as the sul-



phate of glycyrrhizine is not entirely insoluble in cold water. The precipitate is then well dried, and dissolved in boiling absolute alcohol. On the evaporation of the alcoholic solution, the sulphate of glycyrrhizine remains behind as a dark brown transparent body. It is soluble in boiling water after long boiling, and the solution is perfectly neutral.

To determine the quantity of sulphuric acid in this salt, a certain quantity of sulphate of glycyrrhizine of known weight was dissolved in water, and to the clear solution chloride of barium added until no more white precipitate was formed. As the glycyrrhizine also forms a compound with barytes, the precipitate was digested in the warmth with pure hydrochloric acid, which dissolves the barytes compound and leaves behind the sulphate of barytes. This was filtered, dried, weighed, and the weight of the sulphuric acid deduced by calculation. The sulphate of glycyrrhizine was found to consist in 100 parts of 7.34 sulphuric acid and 92.66 glycyrrhizine.—*Journ. für Prakt. Chem.*, xxviii. p. 1.

*On Indian Copal.* By M. FILHOL.

[Concluded from page 264.]

*Analysis of the hard Indian Copal.*—The author separated the resins of the Indian copal according to the principles which were detailed in our last Number, and found in it five different kinds, which however do not entirely agree with those obtained by Berzelius and Unverdorben from the African copal. Their elementary analysis afforded results however which agree very well with the recent investigations on the composition of resins.

Pulverized copal was extracted with alcohol of 0.895, the solution filtered, and immediately precipitated with an alcoholic solution of acetate of copper. The very abundant flocculent greenish blue precipitate was collected and dried as quickly as possible, carefully excluding the air. At 104° to 122° it melts and gives off some essential oil, at 212° essential oil and water, and forms on cooling a greenish blue transparent friable mass. Æther extracts a blue compound from this mass, from which the *alpha*-resin may be separated. The slight residue contains several resins. The alcoholic solution of copal, from which the *alpha*-resinate of copper has been precipitated, is green, and contains the *beta*-resinate of copper in solution. The portion of the copal insoluble in alcohol of 0.895 is tenacious, and abandons to boiling absolute alcohol a mixture of the above two resins, together with a third, the *gamma*-resin. What remains undissolved in absolute alcohol is soft and elastic, dissolves partially in alcoholic solution of caustic potash, from the filtered solution of which sulphuric acid throws down the *gamma*-resin mixed with some *delta*-resin. From the residue insoluble in the spirituous solution of potash, alcohol of 0.970 extracts a small quantity of the *delta*-resinate of potash. The residue which now remains, and which is perfectly indifferent towards solvents, is the *epsilon*-resin, which becomes soluble in time by oxidation. It is however difficult to de-



cide whether the resins separated by means of the alkalies are contained as such in the copal; the *gamma*-resin obtained without alkalies is, it is true, perfectly identical with that precipitated from the potash solution, while on the other hand it is known that copal powder, moistened with caustic potash and exposed to the air, gradually becomes dark red.

*Alpha-resin*.—The above-mentioned *alpha*-resinate of copper is dissolved in alcohol containing hydrochloric acid, the solution diluted with much water, the precipitated resinedulcorated with boiling water to which some hydrochloric acid has been added, and lastly with pure water, and is dried as quickly as possible; or the copper may be precipitated with sulphuretted hydrogen, the solution then evaporated, and the resin separated by re-solution in dilute alcohol from any sulphur. When fresh prepared this resin is soft, and in every respect similar to Burgundy pitch; it also contains some essential oil, which it loses on boiling with water. At  $212^{\circ}$  it melts, becomes transparent and of a lemon yellow; on cooling it is very brittle; it dissolves entirely in alcohol of 0.884, in æther, and in oil of turpentine; thrown on to incandescent coal it diffuses a pleasant smell. The compounds of this *alpha*-resin with bases dissolve in æther but not in alcohol, with the exception of the resinate of potash, which is also somewhat soluble in water, but from which it is immediately precipitated by an excess of alkali. Metallic salts produce in the solutions of the *alpha*-resin coloured and gelatinous precipitates; the combination with oxide of copper is greenish blue, and contains 11.34 per cent. oxide of copper (atomic weight of the resin 3911). The lead compound is white in the fused state, transparent, and contains 26.17 to 26.32 per cent. oxide of lead (atomic weight of the resin 3919). The ammonia compound dissolves in alcohol; only by long boiling does it give off its ammonia entirely. This resin therefore is, with the exception of the yellow colouring, very similar to the *alpha*-resin of Unverdorben from the African copal; from which it would seem that the kind examined by that chemist was that to which Guibourt has applied the name of *Copal des Hottentots*, which in fact is nearly colourless. The author analysed the resin, separated from the combination with copper and dried at  $212^{\circ}$ ; and also the lead compound precipitated with an alcoholic solution of sugar of lead, from a spirituous solution of the pure resin which had been dried in hydrogen gas. He obtained—

Carbon . . .	76.91	76.76	76.61	77.12	40 =	3000.0	77.18
Hydrogen . .	10.13	10.12	10.20	10.03	62 =	387.5	9.93
Oxygen ..	12.96	13.12	13.19	12.85	5 =	500.0	12.89
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>		<u>3887.5</u>	<u>100.00</u>

The formula  $C^{40}H^{32}O^5$  would give as atomic weight 3900, but the per-centage composition would then exhibit too great a difference, especially a loss in the hydrogen. The analyses moreover show how difficult it is to preserve the resins from oxidation.

*Beta-resin*.—This is easily obtained from the above-mentioned green alcoholic solution, by precipitating the copper with sulphu-



retted hydrogen, &c. If hydrochloric acid and then water were added to the solution, the resin, from its solubility in weak alcohol, would separate only imperfectly, and moreover in the state of an emulsion. The resin, washed with hot water and purified by solution in cold weak alcohol, is soft, transparent, melts far below  $212^{\circ}$ , is lighter than water, and dissolves in every proportion in alcohol, æther and oil of turpentine. When fused for some time or boiled with distilled water, it gives off much essential oil, and then becomes quite similar to the previous resin; it is brittle and of a lemon-yellow colour. This also occurs when fused in a current of hydrogen. The combinations with bases are similar to the *alpha*-resinates, but they not only dissolve in æther but also in alcohol. The copper compound is pure green, and melts somewhat below  $212^{\circ}$  to a perfectly transparent mass. The author endeavoured to prepare the lead compound by melting the *beta*-resinate for a long time with an excess of oxide of lead, extracting the mass with alcohol and evaporating the solution. In this manner always transparent, easily fusible compounds were obtained, the amount of oxide of lead of which varied between 25 and 28 per cent., so that an analysis appeared useless. The alkaline *beta*-resinates are tenacious. The *beta*-resin seems to have the same composition as the *alpha*-resin:—

Carbon .....	76.85	77.04
Hydrogen .....	10.08	10.03
Oxygen .....	13.07	12.93

*Gamma-resin*.—When the solution obtained by treating the copal with absolute alcohol is thrown down with acetate of copper, the precipitate dried and treated with æther, a *gamma*-resinate remains undissolved, but only in small quantity. It is best obtained, and in greater abundance, when the portion of copal insoluble in absolute alcohol is extracted with a spirituous solution of caustic potash, the filtered solution decomposed with dilute sulphuric acid, the precipitate welledulcorated with water, dried, and purified from any mixed *delta*-resin by re-solution in absolute alcohol to which some æther, has been added. The *gamma*-resin is white, pulverulent, very light, less fusible than the preceding ones, and is soluble in alcohol and in æther. Its compounds are neither soluble in alcohol nor in æther with the exception of the resinate of potash, which dissolves tolerably well in alcohol and in the spirituous solution of potash; less so in water. The copper compound is a blue powder; the lead compound is white and melts with difficulty. This resin forms the greater portion of the copal; it contains less oxygen than the former, and appears to be  $= C^{40} H^{31} O^3$ :—

Carbon .....	80.70	80.53
Hydrogen .....	10.43	10.66
Oxygen .....	8.87	8.77

The *delta*-resin was obtained in too small quantity for analysis; just precipitated it is gelatinous, and when dried forms a white powder, insoluble in alcohol and æther, but soluble in a spirituous solution of potash. The melting-point is somewhat high.

*Epsilon-resin*.—The portion of the copal insoluble in caustic



potash is extracted with alcohol of 0·884 from the residue, the *delta*-resin removed from the residue by boiling with alcohol of 0·970; what remains undissolved is first treated with acid, and then with pure boiling water. The residuary resin forms little gelatinous lumps, insoluble in æther, alcohol, oil of turpentine, or caustic potash, and dries into hard granules. If these are pulverized and exposed to the air, they become gradually soluble. The *epsilon*-resin cannot be combined with bases, and appears to be =  $C^{40}H^{31}O^2$ .

Carbon .....	81·16	81·68
Hydrogen .....	10·54	10·43
Oxygen .....	8·30	7·89

The author intends shortly to examine the soluble copal obtained by the oxidation of the copal powder.

The author analysed *soft* Indian copal, which occurs in commerce in large perfectly white globular drops of from 60 to 80 grammes in weight, externally earthy and impure, but inwardly transparent. It melted at 212°, dissolved completely, even in the cold, in oil of turpentine, but very sparingly in absolute alcohol. It was found to consist of—

Carbon .....	85·30	85·36
Hydrogen .....	11·50	11·53
Oxygen .....	3·20	3·11

This, and also the great resemblance of several kinds of the soft copal to the animé-resin, speak decidedly in favour of the author's view, that all the resins (commencing with animé, through the soft copal to the Indian copal and that from Madagascar) form a continuous series with increasing amount of oxygen. The author intends shortly to examine the copal from Madagascar and also the animé-resin.—*Journ. der Pharm.*, 1842, pp. 301, 507.

#### Atomic Weight of Nitrogen.

If the atomic weight of nitrogen be calculated from the specific gravity found by Dumas and Stas (= 0·972), the number 87·908 is obtained instead of that hitherto generally adopted of 88·518. According to Berzelius\*, Svanberg has obtained a still lower number in experiments with anhydrous nitrate of lead, in which he endeavoured to determine the base with the greatest accuracy, in order to find the atomic weight of nitrogen from the residue, calculating according to the formula  $N O^5$ .

100 parts nitrate of lead gave—

67·4030	oxide of lead,	N =	87·1210
67·4036	... ..	=	87·1395
67·4043	... ..	=	87·1780
67·3956	... ..	=	87·3190

Mean ..... 87·189

*Journ. für Prakt. Chem.*, Dec. 1842.

\* Jahresbericht, 22nd Year, Part II.



*Poisoning by Binoxalate of Potash.*

A case of poisoning has been communicated to the Institute of France by M. Bodichon, from the administration of binoxalate of potash in mistake for tartrate of potash. Death resulted with frightful convulsions. These salts, both of which occur in common, and are to be found in all our druggists' shops, are most readily mistaken for each other.—*Repert. of Patent Inventions*, No. 3, 1843.

*Action of Chromic Acid and Bromine on Piperine.*  
By M. GERHARDT.

On treating piperine with bichromate of potash and sulphuric acid, it disengages much carbonic acid, and at the same time a somewhat acid aqueous liquid distils over, which reduces the nitrate of silver when warmed. The residue smells slightly of bitter almonds. Evaporated to dryness, then dissolved in alcohol and water, and afterwards in water, the residue gives a greenish extract substance, which does not exhibit the least trace of crystallization. Bromine converts piperine into a peculiar substance, which however could not be obtained crystallized.

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ANALYTICAL CHEMISTRY.*On some Separations effected by the Means of Sulphurous Acid or of the Alkaline Sulphites.* By M. P. BERTHIER.

SULPHUROUS acid and the alkaline sulphites have been employed for some time with advantage in several quantitative operations. I myself have indicated some of their uses, and have shown in particular,—1st, that the oxide of titanium and zircona, substances from which it is exceedingly difficult to remove the last traces of iron, may easily be obtained perfectly pure by means of sulphurous acid; 2nd, that oxide of chromium may easily be separated from iron, alumina from glucina, &c.; and on this occasion I endeavoured to ascertain the action of sulphurous acid on the most common metallic sulphurets and on some oxides. I have since found this reagent, whether free or in combination with the alkalies, susceptible of new applications, which appear to simplify several analytical operations. Before proceeding to describe these, I will briefly notice the fundamental properties of the principal sulphites.

The *sulphites of barytes* and of *strontia* are nearly insoluble in water, and but very slightly soluble in sulphurous acid.

Sulphurous acid readily dissolves carbonate of lime, even native. The *sulphite of lime* is scarcely more soluble in water than the sulphate, but it dissolves in tolerable quantity in sulphurous acid; when, however, the solution is boiled, it separates for the greater part in the state of granular crystals.

Calcined *magnesia* dissolves easily in sulphurous acid even in the



cold; the liquid is not rendered turbid by boiling, and when concentrated, or left to spontaneous evaporation, affords transparent prismatic crystals of the sulphite.

*Yttria*, either hydrate or carbonate, dissolves in sulphurous acid; solutions of its salts are not precipitated by the alkaline sulphites in the cold, but when boiled the earth is entirely thrown down as subsulphite, which is perfectly insoluble in water but soluble in sulphurous acid.

*Glucina* behaves in the same manner as magnesia.

*Alumina* dissolves in sulphurous acid, but only when in the state of the moist hydrate; it is entirely thrown down by boiling; the precipitate is the hydrate and not a subsulphite. This hydrate is gelatinous, easily collected and edulcorated, and after desiccation is pulverulent, opake, and of a beautiful white. The alkaline sulphites with an excess of acid do not cause any turbidness in salts of alumina in the cold, but when boiled the earth is completely separated. When an excess of ammonia is added to a solution of the sulphite of alumina, a considerable portion of the precipitate is redissolved, but on boiling the dissolved portion is again deposited. When a solution of the *phosphate of alumina* is boiled with sulphite of ammonia, the whole of the phosphate is thrown down; but when a solution of the *arseniate of alumina* is treated in the same manner only pure alumina is precipitated, and the whole of the arsenic remains in the liquid in the state of arsenious acid.

*Zircona* and *titanic acid*, even in the moist hydrated state, dissolve but very sparingly in sulphurous acid, and the dissolved portion separates entirely on boiling the solution. No opacity is produced in the cold by sulphite of ammonia in solutions of zircona and titanium; but when boiled till no more smell of sulphurous acid is given off, the two oxides are completely precipitated; they are both easily collected, and after washing with hot water do not retain any notable quantity of sulphurous acid.

The *ammoniacal carbonate of uranium* dissolves easily in the cold in sulphurous acid; when boiled the whole of the uranium falls down in the state of a granular and beautiful yellow subsulphite. The solutions of the yellow oxide of uranium are likewise decomposed by the sulphite of ammonia on boiling, but they are not affected in the cold.

When sulphurous acid is added in excess to *tungstate of ammonia* no alteration ensues; and if this liquid is then saturated with sulphuric acid, the tungstic acid is thrown down without the sulphurous acid altering its appearance even when boiled.

*Molybdate of ammonia* behaves differently; the sulphurous acid soon causes it to become of a beautiful blue; but no precipitate is formed, and it may be concentrated in a closed vessel without its becoming opake or losing its colour.

In order to dissolve the *hydrated oxide* or the *carbonate of chromium* in sulphurous acid, it is requisite to employ much water and to use an excess of acid. The liquid obtained is green, and on boiling deposits the oxide of chromium in the state of a granular and green subsulphite.



Ammonia causes no opalescence in it, neither do the alkaline carbonates, but these reagents impart to it a faint wine-colour similar to that of the acetate of chromium. The alkaline sulphites do not precipitate the salts of chromium even when exposed to long boiling. When sulphurous acid gas is passed into a solution of the neutral *chromate of potash*, a considerable brown deposit is formed of deutoxide of chromium; subsequently the precipitate becomes green and gradually redissolves; the green liquid then contains sulphuric, hyposulphuric and sulphurous acid; on boiling, the sulphurous acid is disengaged, and nearly the whole of the oxide of chromium is thrown down in the state of subsulphite of the protoxide. Sulphurous acid imparts immediately a green colour to solutions of the *alkaline bichromate* without producing any turbidness, and converts them into a mixture of the sulphate and hyposulphate of the oxide of chromium; no precipitate is formed on boiling.

The *carbonate of cerium*, such as is obtained from cerite, dissolves without difficulty in sulphurous acid. The salts of cerium are not rendered turbid by the alkaline sulphites, but on boiling they are completely decomposed, as also the pure sulphite, and the whole of the metal is separated in the state of a granular and white subsulphite, just as with yttria. Lanthanium and didymium, if contained in this mineral, behave in the same manner.

It is well known that on dissolving all the *oxides of manganese* which contain more oxygen than the protoxide in sulphurous acid, a mixture of the sulphate, hyposulphate and sulphite is obtained. To prepare the pure sulphite it is necessary to employ the carbonate, which dissolves entirely in an excess of acid; but if this excess be expelled by heat, a subsalt is precipitated, which is very slightly soluble in water, but redissolves easily in sulphurous acid. Solutions of manganese are not affected in the cold by sulphite of potash, but when boiled behave as the pure sulphite. When, on the contrary, sulphite of ammonia is added to these solutions, no turbidness results, however long the boiling be continued.

*Iron*, in the state of the moist hydrate of the peroxide, dissolves immediately in sulphurous acid, the native hydrate also in some degree. The liquid, at first red, subsequently becomes nearly colourless. When an alkaline sulphite is added to a solution of a salt of the peroxide of iron, it immediately becomes of an intense red, although very dilute; but it is almost instantaneously decolorized on the application of heat, and even in the cold this takes place spontaneously and in very little time, sulphuric acid being formed and the peroxide being reduced to the protoxide. The solutions are not rendered turbid by boiling if the air be excluded; but if, after the excess of acid has been expelled, they are exposed to the action of the atmosphere, a reddish-brown substance, which must be a subsalt of the peroxide of iron, soon separates, especially when the solutions are hot, and the liquid itself becomes perceptibly red. The solutions of the sulphite of iron are only precipitated in part by ammonia, and when sufficiently acid probably not at all; but the iron is wholly precipitated by the hydrosulphates after the addition



of ammonia, which would not occur with pure sulphite, as a soluble hyposulphite would be formed.

The *phosphate of the peroxide of iron* in the moist state dissolves with the assistance of heat in sulphurous acid and in the sulphite of ammonia, but slowly and with some difficulty. When sulphite of ammonia is added to a solution of the phosphate of iron, this is at first for the greater part precipitated, but on being boiled gradually dissolves. It is however more advantageous first to reduce it to the state of protophosphate by the addition of a sufficient quantity of sulphurous acid, when it is no longer rendered opaque, either warm or in the cold, by sulphite of ammonia.

The *arsenate of the protoxide of iron* behaves precisely in the same manner, only that it is more soluble from its being more readily converted into the arseniate of the protoxide by sulphurous acid and the sulphites.

*Salts of cobalt and of nickel* are not in the slightest affected by sulphite of ammonia even after long boiling, but they are partially decomposed when boiled with sulphite of potash; a large proportion however of the oxide remains in the solution. The precipitate is a subsulphite, which appears to become more and more basic by edulcoration, which is the case with a large number of insoluble sulphites.

Liquid sulphurous acid acts in the cold on the calcined *deutoxide of copper*, slowly however and but feebly, the liquid becoming perceptibly green. On the application of heat the action is prompt, a blue liquid is obtained containing the sulphate of the deutoxide, and moreover an insoluble crystalline substance in scales of a very beautiful cochineal-red, amounting to 0.8 of the deutoxide employed. On adding sulphurous acid to native or artificial carbonate of copper, effervescence takes place, and a solution is obtained which contains the sulphite of the deutoxide of copper; but this salt gradually decomposes spontaneously at the ordinary temperature, especially when exposed to solar light, and very rapidly when slightly heated. The liquid acquires a blue colour, and then contains only the neutral sulphate of the deutoxide, and a red precipitate of scaly crystals is formed. Sulphurous acid does not affect solutions of the salts of the deutoxide of copper either in the cold or hot; the alkaline sulphites immediately change them into green, which is probably owing to the formation of the sulphite of the deutoxide, but no precipitate is formed at the moment. If the solution is then left to itself, it is gradually decomposed, and very rapidly when heated to boiling; and a heavy, granular, crystalline, shining deposit is formed of a beautiful cochineal-red; and if there was an excess of the alkaline sulphite, scarcely a trace of copper remains in the liquid. This red deposit is the sulphite of the protoxide of copper slightly hydrated, as was proved long since by M. Chevreul. Heated in a retort this salt affords water, sulphurous acid, and a somewhat darker red protoxide of copper. Exposed to a moist atmosphere, it is gradually converted into a mixture of the neutral sulphate and subsulphate of the deutoxide; it is nearly insoluble in water, but



dissolves in sulphurous acid, ammonia, and hydrochloric acid; but even dilute sulphuric acid, without the assistance of heat, decomposes it instantaneously, and converts it into the deutoxide, which dissolves, and into metallic copper, which is deposited in the form of an extremely fine powder, of a deep red, without any lustre, but which under the polishing steel soon assumes a decided metallic lustre.

*Protochloride of tin* is precipitated in the cold by sulphite of ammonia, but not entirely; to throw down the whole of the tin it is necessary to boil it. The precipitate obtained in the cold is a subsulphite of a beautiful white; but when left for a sufficient time in boiling water it abandons the whole of its acid, and is converted into pale yellow anhydrous protoxide. Under certain circumstances, according to M. Girardin, sulphurous acid affords sulphuret of tin in acting on the protochloride of this metal.

The *potassio-tartrate of antimony* (tart. emetic) is not at all affected by the sulphite of ammonia, even when boiled for a long time.

The *oxide of zinc* is soluble in sulphurous acid; on boiling the solution it deposits a subsulphite, which appears to be decomposed by long boiling, becoming less and less soluble. Salts of zinc are not precipitated by sulphite of ammonia even when boiled.

Sulphite of ammonia decomposes the *deutochloride of mercury* (corrosive sublimate) pretty quickly with the assistance of heat; at first some protochloride is formed, which is deposited in small pearly crystalline laminae, and then if the application of heat be continued, and a sufficient quantity of sulphite be present, the chloride becomes gray, then black, and is at last completely reduced. The mercury forms at first a kind of voluminous paste, gradually contracts, but without assuming any lustre; and in order to unite it, it must be heated with muriatic acid.

*Nitrate of silver* is precipitated by the alkaline sulphites, and even by sulphurous acid, but a very small quantity of silver remains in the liquid. The deposit of sulphite is granular, of a beautiful white, and quite similar in appearance to the chloride. It is insoluble in water, and nearly so in sulphurous acid; it is not decomposed by acetic acid, but the powerful acids expel sulphurous acid. It dissolves easily in ammonia. When boiled in water, or dried on a filter at a temperature approaching to  $212^{\circ}$ , it is converted into metallic silver and into the sulphate. It is easily and entirely reduced when an alkaline sulphite is added to the water in which it is boiling. When an ammoniacal solution of chloride of silver, to which sulphite of ammonia has been added, is kept boiling, the whole of the silver is precipitated in the metallic state as a dull, slightly brownish white impalpable powder. On boiling fresh and moist chloride of silver in a solution of an alkaline sulphite, it is likewise quickly decomposed into metallic silver. To obtain this silver perfectly pure, it is necessary to wash it with ammonia.

Solutions of *gold* are immediately reduced even in the cold by sulphurous acid and by the sulphites; the liquid becomes by trans-



presence of a bluish colour, and when boiled the gold is thrown down as a brown powder.

The *deutochloride of platinum* when hot is slowly decolorized by sulphurous acid, but immediately by the sulphites of potash and ammonia if the solution had been previously heated to boiling. When an excess of sulphite is not employed, the liquid remains perfectly transparent, at the same time losing its colour entirely; but in the contrary case a white granular precipitate is formed, which increases on cooling. This deposit, which is probably a double alkaline protochloride, is soluble in a large quantity of water, especially hot. When both the solutions are cold, their mixture immediately gives rise to a yellow granular precipitate of an alkaline deutochloride of platinum; but if this deposit is subsequently heated in a liquid containing sulphite, it dissolves, loses its colour, and the solution, when sufficiently concentrated, deposits on cooling the white granular substance above mentioned.

[The conclusion in our next.]

*Detection of Arsenic by Copper.* By HUGO REINSCH.

This process consists in *acidulating the arsenical fluids with muriatic acid, and boiling them with metallic copper, which then becomes covered by a steel-gray crust of metallic arsenic*. The separation of arsenic by this method is so complete, that no traces of it can be detected in the residual fluid by means of Marsh's apparatus\*.

Besides the precious metals (which are readily distinguished by their colour or brilliancy), bismuth and antimony are the only metals which are precipitated in these circumstances; but bismuth is always deposited in the crystalline form, and antimony constantly covers the copper with a metallic pellicle, which is of a violet tint in weak solutions, and grayish-white in those more concentrated. These two metals are more precisely distinguished by characters which will be indicated in the sequel.

When acids, such as the phosphoric, sulphuric or acetic, containing arsenic, are boiled with metallic copper, the latter preserves its brilliancy unchanged, neither is it affected by an aqueous solution of arsenious acid; but as soon as a few drops of concentrated muriatic acid are allowed to fall on the copper whilst the fluid is still warm, it is instantly covered with the characteristic steel-gray crust of metallic arsenic. This test is sensible in a fluid which contains only the millionth part of five centigrammes of arsenious acid!

To ascertain if this test is applicable to the detection of arsenic when mixed with food, M. Reinsch prepared a mixture of boiled potatoes, milk and soup, and introduced 0.025 gr. of arsenious acid into the mixture. He digested the whole with pure muriatic acid, diluted with an equal weight of water, boiled the liquor, filtered it, and treated it with slips of copper; these were immediately covered

\* M. Büchner has also found that crude arseniferous hydrochloric acid may be perfectly freed from arsenic by rectification over copper filings.—Ed. *Chem. Gaz.*



with the arsenical pellicle, exactly as if the arsenic had been dissolved simply in acidulated water or the mineral acid. This method thus appears to be susceptible of the same applications as Marsh's process, without some of its inconveniences. It cannot, like the latter, give rise to mistakes from the formation of false stains derived from organic matters, or from the employment of arseniuretted zinc, or from the troublesome frothing of the liquid. All that is necessary for medico-legal purposes is, to digest the contents of the stomach and intestines with diluted pure muriatic acid, and to treat the filtered liquid with slips of copper. In the same way the existence of arsenic in the bones may be demonstrated.

To determine the other properties of arsenic, and to obtain conclusive evidence of its presence or absence, the author recommends the following proceeding. The slip of copper covered with the metallic crust is to be carefully washed with water in the same vessel in which it has been boiled with the suspected liquid, and is then to be very cautiously dried over the flame of a candle. It is then to be slipped down to the centre of a glass tube about sixteen inches long, one end of which terminates in a capillary orifice, whilst to the other is closely adapted a small bent tube, having its lower end furnished with a perforated cork. The part of the tube where the copper slip lies is then to be heated for a short time with a spirit-lamp, when arsenious acid sublimes along the tube in small but well-formed brilliant crystals. If during the heating a gentle current of air is blown into the lower orifice of the small bent tube, the arsenious acid forms a white vapour which condenses towards the end of the tube with the capillary orifice. If we wish to test the arsenic in this tube, we have only to seal up the capillary orifice, cut off this end of the tube, and having dissolved the arsenic, may apply to it the usual liquid tests, or it may be introduced into Marsh's apparatus. If, on the contrary, we wish directly to obtain the metallic arsenic on a porcelain plate, we are to adapt, by means of the cork, the bent tube to an apparatus for disengaging hydrogen, and inflame the gas at the capillary orifice. We ascertain the purity of the gas by holding the porcelain plate over it whilst it burns, and then heat the portion of the tube containing the slip of copper; arseniuretted hydrogen is immediately formed, and the metallic crust is obtained on the porcelain; a little arsenious acid is always formed, but by continuing the heat this is equally converted into arseniuretted hydrogen. The disengagement of arseniuretted gas may be continued or interrupted at will by withdrawing the spirit-lamp, for the gas does not present any trace of arsenic when the tube cools, but it appears again on reapplying the heat.

If antimony is present, we obtain somewhat similar results, but the sublimate from this metal is not so manifestly crystalline nor so volatile as that from arsenic. Ordinarily there is also formed by the passage of the current of hydrogen a layer of metallic antimony in the tube; M. Reinsch has never observed this to occur with arsenic. The presence of antimonious acid can likewise be demonstrated in the tube as easily as that of arsenic.



The author conceives that, compared with Marsh's method, his own process has undoubted advantages. These he conceives to be :—

1. Its execution is easier, and requires less time than Marsh's method.

2. It cannot give rise to errors, because the arsenic can be obtained at first in the metallic state, then in the form of arsenious acid, and again in the metallic state on the plate of porcelain, without any loss.

3. It is exempt from the inconveniences of the frothing of liquids, the carbonization of tissues, &c.

4. It equals Marsh's method in point of sensibility, since we are able by it to detect a millionth part of arsenic in a fluid.—*Reperitorium für Pharmacie*, vol. xxvii. p. 13; as given in the *L. and E. Monthly Journ. of Med. Science* for Jan. 1843.

## PHARMACOLOGY.

*On the Liver Oil of the Skate, Raja clavata and Raja batis.*

By MM. GIRARDIN and PREISSER.

UNDER the name of Liver oil is generally understood only that kind which is derived from *Gadus Morrhua*\* (cod liver oil, *Oleum Morrhue*). It is, however, known that in the north of France, and in Belgium, the liver oil of the above two species of skate has been employed with the same, according to the statement of some practitioners, even with *better* effect. The following examination will show that both substances are essentially the same (only that the *Oleum Rajæ* is cleaner), and that the *Ol. Rajæ* likewise contains iodine, and probably in the form of iodide of potassium, as was proved to be the case by Gmelin with respect to the *Ol. Morrhue*. Perhaps, however, the inconstancy which has been observed in the amount of iodine in the latter will also be met with in the skate oil, and many examinations will be requisite to decide *positively* which kinds of these two liver oils always contain iodine (probably the brown and light brown), and whether there be not one which always presents a certain constancy in the quantitative amount of iodine. From the circumstance that the *Ol. Rajæ* only contains fat besides the iodine compound, the authors assert that the entire activity of the agent must depend on the amount of the iodine, a conclusion which has been frequently made with regard to cod liver oil; it must, however, be remembered that the validity of this conclusion is somewhat doubtful.

The *Ol. Rajæ* examined by the authors was similar to that which Dr. Vingtrinier of Rouen has repeatedly employed with great success. Vingtrinier prepares it himself by boiling the skate livers with water, skimming off the supernatant oil, and clarifying by means of decantation. It is of a bright yellow colour, smells of train oil, has

\* To prevent mistakes it will be well in future to distinguish these two oils by the names of *Oleum Morrhue* and *Ol. Rajæ*.



a specific gravity of 0.928, does not redden litmus, and deposits on standing a solid white substance, which is found to occur four or five times after filtration, when the oil has become brighter and smells less strong than before. This white substance was not examined more closely, but appears to be identical with that which is deposited from fish oil. Water does not deprive the *Ol. Rajæ* of any substance; 100 parts of alcohol of 0.836 sp. gr. dissolve at 122° 1.5 parts, at 212° 14.5; 100 parts boiling æther dissolve 88 parts of the oil, but upon cooling the greater portion again separates.

Chlorine gas curiously enough does not colour the *Ol. Rajæ* brown (which it does so quickly with the other liver oil\*), nor does it destroy the smell, but it hastens the separation of the above-mentioned white substance. Concentrated sulphuric acid colours the *Ol. Rajæ* bright red, which in the course of time with shaking becomes dark violet, *Ol. Morrhua* is quickly rendered black; nitric acid does not affect the *Ol. Rajæ*, while the *Ol. Morrhua* becomes brownish orange. Clarified *Ol. Rajæ* easily forms, with caustic potash, a yellowish soft soap soluble in water, from which tartaric acid separates, margaric and oleic acids, and the mother-ley contains phocenic acid and much glycerine.

The oil cannot be deprived of its iodine either by treatment with the vapours of water or by alcohol. When, on the contrary, the potash soap of the oil is decomposed by an acid, filtered, the mother-ley evaporated, and the residue treated with alcohol, this agent then takes up the iodide of potassium. The presence of iodine is best demonstrated by saponifying the oil with an excess of a solution of caustic soda, boiling for a time, drying, carbonifying the soap in a closed crucible with an addition of some carbonate of ammonia towards the end of the operation, the coal is then extracted with alcohol of 0.811 spec. grav. and the solution evaporated, when pure iodide of potassium remains behind. One quart *Ol. Rajæ* gave 0.18 grms. iodide of potassium, the same quantity of the darkest *Ol. Morrhua* only 0.15; if, therefore, the darker kinds of the *Ol. Rajæ* contain most iodine (which the author has also ascertained to be the case with *Ol. Morrhua*), the *Ol. Rajæ* would always contain the greater amount of this ingredient. On this account, and from the possibility of employing it in the pure bright state, it must be preferred to the cod liver oil.—*Journ. de Pharm.* 1842, p. 503.

The presence of iodine in cod liver oil has been denied by some chemists in this country; however, the observations above communicated agree essentially with those inserted at p. 234, according to which the brown coloured oil *always* contains iodine. The absence or presence of this valuable ingredient may account for the variety of opinions entertained respecting the medicinal virtues of this preparation; some are loud in its praise, while others deny that it has any therapeutic action on the body. “Dr. Stacques affirms, that

\* The comparison was made with a very dark coloured stinking *Oleum Morrhua*.



as yet he is in possession of no fact in which, upon analysis, he is entitled to ascribe the good effects said to result from its use to the oil alone. There are probably many cases of cure reported in which the oil was of no service, as the diseases very likely would have got better, even although it had not been administered; but although Dr. S. may be in error in refusing to allow to the different kinds of fish oil any therapeutic agency, yet the mere fact of a book being published by a physician practising in a country where the cod liver oil is so much employed, and who says he has never seen any evident result following its use, is sufficient to show that its efficacy has been much exaggerated."

The Editor of the 'Lond. and Edinb. Monthly Journal of Med. Science,' from which journal the preceding extract is taken, observes, that "without offering an opinion as to the comparative value of remedies in scrofula, we have no hesitation in saying that we have seen great good result from the use of cod liver oil in several cases of this disease." It would be well for the practitioner, previous to prescribing this remedy, to ascertain whether it contain iodine or not, which is no very difficult matter, since it cannot be expected that an oil in which no iodine is present should have the same effect as one containing that ingredient.—ED.

#### *On the Opium of Benares.*

The East Indies furnishes two kinds of opium, one from Bengal and another from Benares. Both differ considerably, in the mode of packing, in form and consistence, from the kinds of opium from Turkey and from Egypt, which till recently have alone circulated in the commerce of Europe. M. W. Ludwig has published the following notice of this opium:—In the course of the summer of 1840 I had an opportunity of seeing, for the first time, a quantity of Benares opium which had come from London. The cases were nearly square, and covered externally with coarse linen, such as is generally found on the packages from the East Indies, as indigo and gum-lac in cakes, &c. This mode of package differs from that of the cases of opium from Smyrna and Egypt, which are oblong, covered with tin and soldered. Each case of Eastern opium contained forty cakes, which were perfectly round, of the weight of 112,500 grs. Each of these cakes was inclosed in a separate casing, and arranged at the bottom of the box; there were twenty in the lowest layer, four in breadth, and five lengthwise; and upon this, and after an intervening layer of cut poppy leaves, was superposed the second layer again of twenty cakes. Each cake was surrounded by a thick envelope of poppy leaves, which covered them entirely, and filled the casing completely. The cakes were dry, pretty hard, yielding slightly to the pressure of the finger. On cutting them in half, an envelope of a finger's thickness, consisting of agglutinated poppy leaves, was perceptible, in which the opium was quite free, like the kernel of a nut; it adhered at no part, and was easily taken out.



The mass is brownish black, partially covered externally with a slight layer of yellowish-white mould; it has the consistence of a somewhat hard pill-mass. In the fresh state the mass is softer, and resembles very much a solid electuary, being also slightly attached to the envelope, but it becomes quickly dried in the air. The smell is extremely penetrating, and the taste is more bitter than that of ordinary opium. No mixture of leaves, or of other impurities, is found in the mass; it appears to be perfectly pure; it takes fire and burns with a clear flame.

The mode of forming this opium into cakes must, from no aperture being perceptible either externally or internally, consist in placing the soft opium upon a stratum of poppy leaves, and then closing it up in the thick envelope by means of some agglutinative substance, since no opium is apparent between the leaves.

In conclusion, M. Ludwig states that one of his friends, who had been six times in China and in the Indies, immediately recognized this kind of opium as that which is preferred in China and in the Indian Archipelago.

## CHEMICAL PREPARATIONS.

### *On the Employment of the Oily Cantharidine as a Substitute for the ordinary Blistering Plaster.*

M. BUCHNER, sen., obtains this preparation by treating the coarsely-pounded cantharides in a displacement apparatus with weak æther of 0.776 spec. grav. until the æther passes free from colour. The greater portion of this latter is removed from the solution, and the residue exposed to a gentle heat until every trace of æther, alcohol and water has disappeared. In this manner 11 per cent. of the cantharides employed is obtained, of a product which is liquid at a temperature of 76° to 86°, but becomes solid at 68°. It has a buttery, unctuous consistence, a greenish yellow colour, and a very disagreeable odour which affects the head. 10 to 15 centigrammes suffice to produce a great blister; it must be applied on taffety or on paper.

The following notice on the above communication is by M. Soubeiran:—The oily cantharidine of M. Buchner differs but slightly from the preparation employed in France, and which is obtained by treating the cantharides with officinal æther. It is an oily substance, which was recommended long since by M. Trousseau as vesicatory; and in fact it is very useful when recent, but if preserved the cantharidine separates gradually in the state of crystals, and the blistering property disappears. The following preparation, of which I have taken the formula from some German journal, but do not recollect the author's name, is employed to far greater advantage:—

#### *Extract Acetic of Cantharides.*

Cantharides in coarse powder . . . . .	4 parts.
Concentrated acetic acid from wood . . . . .	1 „
Alcohol of 0.849 . . . . .	16 „



Digest in the water-bath in a temperature of  $40^{\circ}$  to  $50^{\circ}$ , collate with pressure, filter, distil, and evaporate at a gentle heat. The product has a buttery consistence. M. Trousseau, who experimented with it, has been extremely well satisfied. It is only necessary to grease a little paper with this extract, and to apply it to the skin, to have in a very short time a blister formed. The consistence of this preparation, and especially the presence of acetic acid, prevent the crystallization of the cantharidine.—*Journ. der Pharm.* for Feb. 1843.

*Preparation of the Golden Sulphuret of Antimony.*

Dr. Artus finds, that on employing Schlippe's salt in forming this preparation, however carefully the solution be gradually mixed with dilute sulphuric acid, it has never the same appearance, being sometimes lighter, sometimes darker, owing to the greater or smaller amount of sulphur, which affects in a considerable degree its medicinal virtue. To avoid this he proposes washing the well-dried crystals several times with distilled water previous to their employment for this preparation; then finely pulverizing them in a serpentine mortar, adding 14 parts of cold distilled water, with which they are allowed to stand for 24 hours with frequent stirring. When this solution is filtered, the whole of the separated kermes remains behind; and on adding dilute sulphuric acid to it carefully and by degrees, washing the precipitate with cold water, and drying at a gentle heat, the preparation obtained is always similar in colour and composition.—*Journ. für Prakt. Chem.*, Dec. 1842.

*Preparation of the Oil of Roses.*

In a letter addressed from Arabia to M. Landerer at Athens, the following details respecting this preparation are given:—The roses are conveyed into the distilleries, in which there are from three to six copper alembics without any cooling apparatus. The plucked roses are thrown into the retort, and water thrown on to them, with the addition of a large quantity of salt. After two or three days of maceration the distillation is commenced, and is continued until the liquor which passes over has a yellowish colour. The water of roses, removed from time to time, is conveyed, in order that it may cool, into earthen vessels placed in water; various names are applied to it, and it has a different value according to whether it had been collected at the commencement or towards the close of the distillation.

It is the water of roses obtained at the commencement which is employed in the preparation of the oil or otto of roses, and this is the manner in which it is separated:—After having filled with this water some large porous vessels of clay and covered them with linen, they are buried in rows in the earth, where they are left for nine or ten days according to the coolness of the nights. They are covered externally with straw, which is watered in order to keep them as cold as possible. By degrees the rose-water becomes



covered with a layer of oil, which solidifies; this crystalline mass is removed, and the water subjected to several similar refrigerations, until not a trace more oil is evident. The water, completely deprived of this latter, is sent to the markets to be sold, or is again employed in the preparation of an inferior kind of oil of roses, which is sent to Europe under the name of Oriental oil of roses. This latter is found in the bazaars of Constantinople, of Smyrna, &c., and is obtained by agitating the rose-water, the odour of which is still strong, with an oil derived from Africa, and which results from the distillation of the wood of very tall and odoriferous trees (perhaps sandal-wood?).

*On the Conservation of Mist. Ferri Comp.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

GENTLEMEN,

Will you suggest the desirableness of the following form that I use?—

R̄ Myrrhæ contrit. ʒij.  
 Potas. carb. ʒj.  
 Aq. rosæ, fʒxvss.  
 Sp. myristicæ, fʒ.  
 Sacchari, ʒij.

Mix according to Pharmacopœia, and dissolve  
 Ferri sulph. ʒiiss. in  
 Aq. rosæ, fʒiiss.

When wanted, add to 7 drachms of first mixture 1 drachm of the latter, which saves the trouble of preparing it for every prescription, and is equal to the mixture being fresh made every time it is wanted.

*Ely.*

S. STURTON.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*On a new and cheap Method of Manufacturing Calomel.*  
 By Dr. SCHAFHAEUTL.

THE author was led to make the following experiments from some facts which were accidentally noticed in an experiment of amalgamation, where the red mass obtained by roasting iron pyrites, was mixed with a solution of common salt and rubbed together with mercury.

When metallic mercury is carefully brought into contact with a solution of persulphate or perchloride of iron, no change takes place in the chemical constitution of the solution. When however the mercury is shaken strongly with the solution of the metallic salt, so that it is divided into minute granules, the solution is decolorized in



an instant; and if there be sufficient mercury present, it is changed from a peroxide or perchloride compound into a protosalt or protochloride. A portion of the mercury has become converted into sulphate of mercury, or, curiously enough, into the protochloride, which then forms the coating of the extremely minute globules of mercury. The action is most rapid when the solution is somewhat acid, but it also takes place completely in a neutral solution; a basic solution of a metallic salt however is not perceptibly affected.

When persulphate of iron is triturated with salt, the mass then made into a paste with water, and a drop of mercury added to this mass in the mortar, the metallic mercury loses at the moment of contact its peculiar fluidity and remains stationary like tin amalgam. When this mercury is rubbed together with the mass, protochloride of mercury is formed without any elevation of temperature, and can be very easily obtained by sublimation. At the same time the styptic taste of the peroxide of iron salt is converted into the sweet one of the protoxide, while the previously dark red mass becomes very thick and appears flesh-coloured.

When moreover persulphate of iron is mixed with just so much salt as is exactly requisite for the reciprocal exchange of the constituents, water added to it, and then left to stand so long in the cold and to dry of itself, no mutual decomposition of the two salts occurs. The taste of the mass remains unaltered, the salt crystallizes from it, and the decomposition, *in contact with mercury*, takes place as quickly as in the moment of the first mixing.

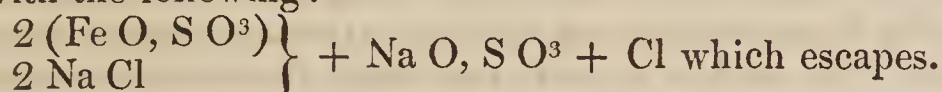
It has been stated above, that in the mixture, even in the moist state, no decomposition takes place in the cold; but when the moist mass is heated to about  $284^{\circ}$  muriatic gas is liberated. When all the water is evaporated chlorine alone is disengaged, and peroxide of iron and sulphate of soda are left behind. But when the persulphate of iron and the salt have been previously heated, only chlorine is disengaged during the whole process of decomposition, which, even when the gas is not collected and the mixture is heated in an open vessel, is immediately perceptible from the smell; and moreover, from the fact that when previous to the heating some leaf gold has been added to the mixture, water extracts after incandescence a gold salt, which affords the most beautiful gold-purple with the sesquioxide of tin.

If the mixture of persulphate of iron and of salt be examined in the first stage of the decomposition resulting from the application of heat, the first thing met with is the unexpected formation of protoxide of iron, the amount of which increases to the middle of the process, and then in the latter half decreases again as regularly to the end, when nothing further can be found than peroxide. Water, which previous to ignition dissolved the persulphate of iron, now extracts only sulphate of soda, and pure peroxide of iron is left behind.

If we represent the mixture by a formula, we have  $\text{Fe}^2 \text{O}^3, 3 \text{S O}^3 + 3 \text{Na Cl}$ . According to this formula, and to Bergmann's theory of double affinity, we should expect to obtain, by the chemical



transmutation of the two electro-negative substances, perchloride of iron and sulphate of soda. But in the first half of the process of decomposition, instead of the formula  $\text{Fe}^2 \text{Cl}^3 + 3 (\text{Na O}, \text{S O}^3)$  we meet with the following:—



And here indeed the decomposition stops, if during the experiment the air be excluded and only a moderately red heat be employed. With a greater heat however the decomposition progresses until sulphate of soda and metallic iron alone remain, while all the chlorine has escaped. But if the atmospheric air has access during the second half of the process, the iron takes from the atmosphere just so much oxygen as it had given up to the sodium, and at last peroxide of iron and sulphate of soda are left. *If, therefore, during the second half of the operation atmospheric air be conveyed into the retort, there will in future be no longer any need of manganese in preparing chlorine.*

The decomposition of the mixture into the protosulphate of iron, &c., in the moist way, has been noticed above; and at the same time it was observed, that under such circumstances instead of heat another chemical element was necessary, viz. mercury, in order to commence the process of decomposition.

To determine more precisely the nature of the process, the author prepared, by treating chemically pure peroxide of iron with some concentrated sulphuric acid, digesting, evaporating and igniting, a mass which contained in 20 grms. 3·456 sulphuric acid, 2·29 peroxide of iron in combination with the sulphuric acid, and 14·254 parts of free peroxide of iron. This quantity of 20 grammes was now mixed with 5·102 grammes chemically pure ignited salt formed into a paste with water, and then 17·45 grammes mercury added, which immediately disappeared on stirring it with the pestle, while the mass became remarkably thick and dry. The mass was now dried completely in the mortar itself at a very gentle heat, conveyed with the greatest possible care from the mortar into a glass retort and weighed with the retort; it now weighed 43·73 grammes, and had therefore combined with 1·18 grm. water. The dry mass had acquired in the mortar a reddish-gray colour, which by trituration was converted into a dark red. After the retort had been kept at a red heat in the sand-bath or over the lamp, it had lost 2·01 grammes. In the neck of the retort and in the recipient was some hydrochloric acid, which did not however amount to more than 0·03 grm. In the upper portion of the neck of the retort protochloride of mercury had crystallized in beautiful needles, and there was also a loss of 0·95 grm. After the retort had been again exposed to free fire, about 0·65 grm. calomel again sublimed.

Some perchloride of iron had sublimed on to the dome of the retort, which did not weigh more than 0·22 grm., together with an undeterminable pulverulent sublimate, probably protochloride of iron or calomel.

These simple data show, first, how very little hydrochloric acid is



set free, even though the mixture contained 10 per cent. water ; and secondly, that in order to prepare pure calomel in a simple and less expensive manner than by the ordinary process, nothing further is necessary than the remains of roasted iron pyrites, or in general to mix anhydrous persulphate of iron with the requisite quantity of salt and mercury, and to submit the whole to sublimation ; while in the usual way of preparing calomel it is first requisite to form the sublimate in order to convert this by means of mercury into the protochloride.

To ascertain whether the calomel in a moist state pre-existed as such, or was first formed by the high temperature, the following experiment was made. The mixture above noticed, of 20 grammes protosulphate, salt, and mercury, which weighed together 42·55 grammes, were conveyed into a well-stoppered flask along with water, and heated over the lamp till they began to boil. What remained undissolved was collected on a filter, and was dried without edulcoration at a very gentle heat. The residue now weighed 32·08 grammes ; the solution contained therefore 10 grammes. The liquid which passed through was tested for chlorine, and was found to contain 1·948 grm. There was therefore 1·052 grm. chlorine, that is, somewhat less than the half of the chlorine actually present, which remained with mercury as calomel in the insoluble residue. 1·052 chlorine requires 0·69 sodium, and this sodium needs 0·237 oxygen to be converted into soda ; consequently, when the amount of persulphate of iron present can set free this quantity of oxygen, it will exactly suffice to convert it into the protosulphate, which was proved to be the case in a second experiment, in which the protoxide of iron was determined by means of carbonate of lime. The decomposition first mentioned therefore commences in the moist way without the application of heat, and immediately, but it only goes through half the process ; the mercury reduces the persulphate of iron to the protosulphate, as was shown by the first experiment, in which protosulphate of iron was merely shaken with mercury ; but when salt is present, protochloride of mercury is formed instead of the persulphate. The same result was obtained with a mixture of persulphate of iron and salt, in which a high temperature wholly replaced the mercury.—*Ann. der Chem. und Pharm.*, Jan. 1843.

#### *Improvements in Daguerreotyping.*

We have been highly gratified by a visit to inspect Mr. Beard's late improvements in the Daguerreotype Portraits. The elegant tinting which these beautiful works receive after the ordinary process has been completed, and which is effected by some secret process, throws a vitality and pleasing expression into the picture, destroying that cold unearthly aspect which has hitherto been so strong an objection. We are sure that as soon as the public become aware of this great step towards perfection, it will repay the zeal and energy which Mr. Beard has displayed.



We also learn from the 'Polytechnic Journal' for March 28th, that Proff. Böttger of Frankfort has succeeded in producing Daguerreotypes in colour; the results of his experiments were shown to A. von Humboldt, who was delighted with them. The professor has however as yet only succeeded in obtaining three colours, the most perfect of which is flesh-colour.

## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

Feb. 21, 1843. (The President in the Chair.) The following communications were read:—

"A short notice from Mr. Francis, announcing the separation of Theine from the *Ilex Paraguensis* or Paraguay Tea," by Dr. Stenhouse.

Extract from a letter from Professor Henry Croft "On the Manufacture of Sugar from the *Zea Mays*," communicated by William Francis, Esq.

[These two communications were inserted at full at pp. 232 and 243.]

"On the exhalation of Carbonic Acid from the Human Body," by E. A. Scharling. Communicated by J. Elliott Hoskins, M.D.

In this communication the author gives the results of experiments made on individuals confined in an air-tight box supplied by a constant current of atmospheric air, and in which they could speak, eat, sleep or read without inconvenience; arrangements being made so that the air withdrawn could be submitted to examination: the results were as follows:—

Males.	Age.	No. hours.	Sleep.	Gramme exhaled.	oz. ac.
1	35	24	7 hrs.	219.000	= 7.72
2	28	24	7	239.728	= 8.45
3	16	24	7	224.379	= 7.90
4 fem.	19	24	7	165.347	= 5.83
6	10	24	9	125.420	= 4.42
5 boy.	9½	24	9	133.126	= 4.69

The author deduces, from these results, that males exhale more carbonic acid than females, and children comparatively more than adults; also that less gas is given off during the night and in certain cases of disease.

"On Æthogen and the Æthonides," by W. H. Balmain.

After alluding to his former paper on this subject, the author states that æthogen may be more readily obtained than by the process previously given, by simply treating a mixture of 5 parts sulphur, 38 of bicianide of mercury, and 7 of anhydrous boracic acid. The method of obtaining the æthonides of the metals consists in treating æthogen with the metallic sulphurets, the sulphur being displaced; or by employing sulphur, bicianide of mercury, boracic



acid, and the sulphuret of the metal whose æthonide is desired, the proportions being such as should give rise to 2 atoms of the metallic sulphuret, 2 atoms boracic acid,  $\text{B O}^3$ , 3 atoms cyanogen and 3 atoms of free sulphur; as thus made, the æthonides require boiling in a mixture of nitric and muriatic acids, and washing carefully. The author, after calling attention to the stability and strong affinities of æthogen, regrets that he has, as yet, not been able to furnish the Society with an analysis of this compound.

“Examination of certain Astringent Substances,” by Dr. Stenhouse, Glasgow. (Continuation of former paper.)

*Black and Green Tea.*—The aqueous infusions of both varieties give dull olive-black precipitates with protosulphate of iron, which on standing become leaden-blue. The same infusion evaporated to dryness and heated in a retort, affords crystals of theine by sublimation, accompanied by a decided trace of pyrogallie acid. A peculiar essential oil exists in tea, more abundantly in the green than in the black.

By treating the evaporated infusion with æther, crystals of gallic acid were obtained from tea. It is to the decomposition of this substance that the pyrogallie acid seems due, and not to the tannin which is also present.

*Myrobalans.*—The fruit imported from the East Indies under this name consists of a kind of nut, inclosed in a brownish-yellow husk of considerable thickness. This husk contains a very large quantity of astringent matter, which it yields to water; yellow colouring matter is also present. Myrobalans contain much gallic acid, and also a peculiar modification of tannin.

*Bistort*, root of *Polygonum Bistorta*.—This root, which abounds in many places, yields a highly astringent infusion, containing both tannin and gallic acid, and also a red colouring matter and much mucilage.

*Cashew Nut.*—The outer rind of this nut contains much fatty matter, which is easily saponifiable, solid at common temperatures, and very acrid, raising blisters on the skin. It contains also a peculiar variety of tannin, giving bluish-black precipitates with salts of iron, and a little gallic acid.

*Pomegranate Rind.*—This also contains an astringent principle, due to a variety of tannin, which gives greenish-black precipitates with salts of iron. No gallic acid could be found.

*Larch Bark.*—The bark of the larch is used to some extent in Scotland for tanning, but gives an inferior leather. The aqueous infusion is strongly acid, gives greenish precipitates with salts of iron, a reddish-yellow precipitate with oil of vitriol, which, when the whole is heated, dissolves with a beautiful scarlet colour. The bark is rich in mucilage and resin.

Birch and alder barks and tormentil root give infusions resembling very much those of the larch bark.

The author concludes with a remark on the extreme difficulty of investigating bodies such as these varieties of tannin, which are incapable of crystallizing.



## REVIEWS.

*Agricultural Chemistry rendered Simple for Practical Purposes.*  
By THOMAS GEORGE TILLEY, PH. D., &c. London: Longman. Edinburgh: Maclachlan and Co. Dublin: Curry and Co. Parts I. to IV.

THE present work on agricultural chemistry is suited to convey to its readers a general view of all the points in which science comes into contact with cultivation and husbandry. The advantage which it possesses over other works of a somewhat similar nature, consists in the manner in which the information is conveyed, suited to render it at once popular and useful to the class for whose instruction it is particularly written. The matter is classified generally, and in such form as to render palatable and interesting what a minute division would have made tedious, and therefore less instructive.

*What to do in Cases of Poisoning.* By J. RENNIE. London: Sherwood, Gilbert and Piper.

The only thing we can say in praise of this work relates to the form in which it is published, which may be said to be convenient; but with regard to the matter contained in it we must defer expressing any opinion until the author informs us "*What to do.*" The following specimens may serve to give an idea of the difficulties we have encountered. According to our author heavy spar is the common name for protoxide of barium, sal prunella for hydrated nitrate of potassa, &c. Among the "*What to do's*" Mr. Rennie recommends a solution of wheat flour in water to be given immediately as an antidote for the salts of iodine, while on the wrapper iodide of potassium is stated not to be decomposed by starch.

## PATENTS.

*Patent granted to Thomas Bell, Saint Austell, Cornwall, Mine Agent, for Improvements in the Manufacture of Copper.*

THE copper ores to be operated on are first reduced to such a size that all the particles will pass through a sieve containing four holes per square inch. The ore is then to be taken to an air or melting furnace, commonly called a melting furnace, and is thrown into a hopper placed over an opening in the arch or vault of the furnace. The quantity of ore to make a charge will depend upon the size of the furnace, but a suitable furnace for one to one ton and a half per charge will be most convenient. To every 20 parts of ore put into the hopper, 1 or more parts of lime or other carbonaceous matter, either slaked or unslaked, are to be added. When the furnace is at a white heat, the slide in the bottom of the hopper is withdrawn, and the charge pulled down into the furnace, where it is levelled and spread over the bottom by means of rabbles or other tools worked from the side doors, or at the drawing-hole. If the ores be very much impregnated with sulphur, arsenic, clay, or clay



slate, then to every 20 parts of ore from 2 to 3 parts of lime, limestone, fluor spar, chalk, or other calcareous matters, are thrown into the furnace and scattered over the surface of the ore. A little sharp slag, or the skinning from the jigging sieves, may also be added; but if the ores contain, or are mixed with, much lime or limestone, as frequently occurs where the ores are in a matrix composed of limestone, fluor spar, &c., then a less quantity of limestone will be required; but in all cases the quantity of calcareous matter to be added to the charge must depend on the judgment of the smelter. The charge having been arranged in the furnace as before described, the doors are all closed and luted up, and a brisk heat is applied to the ore and limestone. In about three or four hours the charge will be melted, when the doors are to be opened and the charge well stirred with a rabble; after which a fresh charge of ore and calcareous matter may be added in the proportions before given; and the doors being again closed, the fire is increased, and in three or four hours' further time the second charge will also be melted. The melted ore, after being well stirred, is then drawn or run out of the furnace into a sand or other mould or bed, formed against the sides or end of the furnace. This melted mass will be composed of vitrified copper, ore, iron, sulphur, earthy or calcareous matters, &c. and when cooled is broken into pieces of ten or twelve pounds, weight each. When the core is rich, another method of treating the ore in the air or melting furnace is as follows:—The operations of charging the furnace and melting the ores are as before described, but instead of drawing out all the melted materials at the door, a part only of the upper surface of melted matter is so withdrawn; the remaining portion being much richer in copper, and consequently more fluid than the other, is “tapped” or run out at the side tap-holes, into sand moulds or forms, and the two portions so respectively withdrawn are kept apart from each other; but both are afterwards melted in the cupola furnace. It is only advisable to employ this method when the ore is very rich, and contains much black, gray, native carbonate, or other tender and rich descriptions of copper ore; but if yellow ore or copper pyrites be the ore used, then the operations first described are the most desirable to be employed.

The advantage of the process or processes are considered to be—

1. A saving of time in bringing the copper contained in the ore into the state of granulated fine or pink metal.
2. A saving of fuel.
3. A saving of expense in the number of furnaces required to smelt a given quantity of ore; and,
4. A saving in the quantity of copper obtained from a given quantity of ore.

The author does not claim the melting furnaces, nor the blast or cupola furnace, nor the jigging or washing apparatus; but the mode of treating copper ore by causing it to be melted in order to get it into suitable sized blocks or lumps, and then smelting the same in a suitable blast furnace; and subsequently separating the metal from the product therefrom by washing apparatus.—Sealed July 29, 1842.



# THE CHEMICAL GAZETTE.

No. XII.—April 15, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Action of Potash on the Alkaloids and on Chinoleine.*  
By M. GERHARDT.

WHEN quinine is heated in a retort with a solution of caustic potash, so concentrated that it solidifies on cooling, a milky liquid passes over, which contains a yellowish oil in suspension. This oil exhibits a strong alkaline reaction, and has the smell of the St. Ignatius beans; it dissolves easily and without residue in all acids. More of it is obtained when the potash is allowed to fuse; but as the mass loses its water, the product becomes coloured, for it does not distil over alone without being changed. In this reaction it disengages hydrogen gas; the residue becomes black if the water is not replaced as it evaporates, and we then also observe the formation of a little ammonia. This latter product is however only accidental, and may be avoided if the heat be moderated and the mass kept in a moist state. Cinchonine undergoes just the same reaction, but affords chinoleine still more easily, in larger quantity, and purer than quinine. When strychnine is subjected to the action of fusing potash, a liquid containing chinoleine is obtained; but the quantity of it, compared to the amount of substance employed, is not so considerable as with quinine, or with cinchonine. The residue is soon carbonified, and then affords nothing more of a definite nature. Strychnine, as also the other alkaloids, becomes, in the first moments of the action of the potash, red; but it is not so easily attacked as quinine, and the alkaline vapours only appear when the potash has become fluid. If, previous to the appearance of the vapours, the red mass is dissolved in boiling water, a small quantity of strychnine remains undissolved, and acids precipitate from the solution abundant yellow flakes, which appear to constitute a new acid. They are insoluble in æther, in water and in cold alcohol; with the application of heat they dissolve in the latter medium, and are deposited on cooling. The alcoholic solution becomes, by exposure to the atmosphere, gradually red, and the flakes which are then deposited are of a deep red. When the red potash salt is supersaturated with an acid, a smell resembling the indigo-bath is perceptible. When piperine is treated with fusing potash, the mass becomes coloured, with evolution of hydrogen and ammonia, and a potash salt is formed, from which mineral acids throw down brown



flakes, which on being heated afford a small quantity of a sublimed compound in long colourless needles, at the same time leaving behind a very considerable residue of carbon. On distilling the mixture of potash and piperine, the mass, when it comes into fusion, evolves at first a faint odour of pepper. Subsequently a milky water passes over, and on applying a stronger heat hydrogen is evolved, and the mass puffs up. Towards the end of the operation an evolution of ammonia is perceptible. The residue, dissolved in water, affords a brown solution and an insoluble portion. The milky water does not clarify on the addition of an excess of acid, which is the case on the decomposition of quinine and cinchonine into chinoleine. Codeine also affords no chinoleine.

This chinoleine resembles aniline and nicotine in being an alkaloid free from oxygen =  $C^{38}H^{20}N^2$ ; it appears to be formed by the action of potash on all alkaloids, which already contain carbon and nitrogen in this or in a larger number of atoms; piperine and codeine afford therefore no chinoleine, as is evident from their formulæ.

The following is the best method for preparing chinoleine:—Some pieces of caustic potash are conveyed into a retort and allowed to fuse, upon which a small quantity of pulverized cinchonine is thrown on to it; and the heat increased until the alkaloid becomes brown and puffed up in consequence of an evolution of hydrogen; and finally disengages acrid vapours, which are condensed in a recipient containing water. As they pass over, the residue, floating on the surface of the potash, diminishes, but does not entirely disappear, the product of the reaction being slightly altered by the heat. It is advantageous not to employ too much cinchonine at once, but to add it by degrees. In this manner a milky liquid is obtained, the lower portion of which contains a somewhat yellow transparent oil, which is chinoleine. During the reaction no ammonia is evolved. The milky liquid, when the product is too much coloured, which however is not the case when cinchonine is employed, may be rectified.

Chinoleine has a very characteristic odour, resembling that of the Ignatius beans; and this is so distinct that it affords a very good means of ascertaining whether during a reaction chinoleine is formed. Thus it is evident on submitting quinine to destructive distillation, it is then however mixed with the smell of ammonia, and the reaction is not so distinct. It is heavier than water, dissolves in it in small quantity, but renders it milky on a larger addition. Acids, even acetic and other vegetable acids, clarify the solution, and dissolve the chinoleine entirely; it then loses its odour, and acquires on saturation with acids that of fruit-sap. But the salts, when crystallized and again dissolved, have no smell. Chinoleine is extremely acid and bitter; its salts are also very bitter. It does not appear to possess any poisonous properties in small doses.

The aqueous solution of chinoleine colours red litmus paper blue, and has the peculiar smell of this alkaloid. It does not precipitate the pernitrate of iron, sulphate of copper, nor acetate of lead; but with nitrate of silver, perchloride of mercury, perchloride of gold,



and perchloride of platinum, it affords white precipitates. The hydrochlorate solution also produces precipitates in these chlorides. Chromic acid affords a yellow crystalline precipitate. Tincture of iodine and bromine colour the milky solution of chinoleine brownish red.

Chinoleine forms very distinct crystalline salts; when separated from its combinations by a mineral alkali it possesses its peculiar odour. The sulphate forms beautiful white radiating crystals, which are very soluble in water and in alcohol; the muriate and nitrate crystallize in fine needles. Its combination with chloride of platinum is the most easily prepared and purified of all its salts.

Chinoleine can only be rectified with water, otherwise it is considerably changed; when distilled alone, the first drops of the liquid which pass over are nearly colourless, being carried over along with the aqueous vapours. This behaviour is common to all nitrogenous and oxygeniferous organic substances possessing a very high equivalent. Chinoleine is very soluble in alcohol, æther and essential oil.

*Chloride of Platinum-Chinoleine.*—Chloride of platinum produces in the hydrochlorate solution of chinoleine an abundant precipitate of yellow flakes, which are nearly insoluble in cold water and in alcohol, but dissolve in boiling water, from which on cooling the combination is deposited in a crystalline state. If there is very little chinoleine in the solution, or if it is very slightly diluted, the precipitate does not take place immediately, but by the next day very beautiful yellow needles are formed, which consist of the same salt. When crude chinoleine is employed, such as is obtained from quinine, all the impurities remain on the solution of the yellow precipitate in boiling water on the filter. A second crystallization suffices to render it perfectly pure, which is easily ascertained from its being deposited directly on the cooling of the boiling water in the crystalline state, while the supernatant liquid remains clear. The salt dried at  $212^{\circ}$  was found to consist in 100 parts of—

	Found.		Atoms.		Calculated.
Carbon . . . .	32.99	32.51	38 =	2850	32.98
Hydrogen ..	3.14	3.28	22 =	275	3.18
Nitrogen ..	4.42		2 =	350	4.06
Chlorine ..			6 =	2700	31.24
Platinum ..	27.80	28.08	2 =	2466	28.54
				8641	100.00

Chinoleine is therefore free from oxygen =  $C^{38} H^{20} N^2$ , and contains in 100 parts 82.6 C, 7.25 H, and 10.05 O; its atomic weight is 3450. It is formed from quinine by the loss of  $C^2 O^4$  and  $H^4$ ; from the cinchonine by the loss of  $C^2 O^4 H^6$ , and the reception of  $H^2 O^2$ ; finally, from strychnine by the loss of  $3 C^2 O^4$  and  $H^{12}$ , and the absorption of  $4 H^2 O^2$ . The carbonic acid remains in all cases in combination with the potash, the hydrogen is evolved; perhaps the hydrogen is only secondary. The alkaloids first afford water, and subsequently the oxygen of the hydrate water of the potash combines with a portion of their carbon, while hydrogen is set free.—*Journ. für Prakt. Chem.*, xxviii. p. 61.



*Poisoning from Lucifer Matches. By R. A. LAFARGUE.*

On November 30, Mr. Young, house-surgeon to the Leicester Dispensary, requested me to assist him in examining the body of a little girl, aged six months, who five days previously had sucked the end of several lucifer matches, commonly called "Albert and Victoria." The following are the symptoms as given me by Mr. Denton, the medical attendant, and the parents.

About eight hours after sucking the matches violent sickness came on, which continued during a night and day; the matter ejected being luminous, and, as well as the breath, emitting a strong phosphorescent odour. After the cessation of the sickness, the child lay in a drowsy, stupid and comatose condition, till within a few hours of its death, when it was seized with convulsions, and died in one of the paroxysms. The bowels during the whole time were sluggish, requiring frequent exhibition of enemata to cause evacuations.

On opening the abdomen the peritonæum presented nothing abnormal. Near the pyloric orifice of the stomach a large injected patch was seen, the mucous membrane being thickened and softened. The duodenum and jejunum were quite in a healthy state; along the whole course of the ileum several oblong patches, from half an inch to three inches in length, attracted notice, the mucous membrane being thickened, softened, and in many places ulcerated; the colon and rectum were healthy; the liver was larger, paler, and more indurated than natural; the lungs and pleura were healthy; the pericardium contained from half to one ounce of fluid. Neither the brain nor œsophagus were examined.—*Prov. Med. Journ.*

*Observations on Hyperchlorous Acid. By M. PELOUZE.*

The author found that very much depends, in the preparation of hyperchlorous acid by the action of chlorine upon oxide of mercury, on the state of this latter, and on the rapidity of the evolution of the chlorine. When oxide of mercury prepared in the moist way, perfectlyedulcorated and dried in the air, is thrown into a balloon filled with dry chlorine, a quantity of crystals of perchloride of mercury make their appearance with violent evolution of light and heat, and the colour of the gas becomes of a very pale orange. If the balloon is opened under water, it fills to within a small residue of oxygen gas, which moreover varies according to the quantity of the chlorine employed, the temperature, and the degree of division of the oxide of mercury. If the balloon is cooled very much during the process, there is no appearance of light, the temperature is raised but very slightly, and nearly the whole of the chlorine is converted into hyperchlorous acid. If a rapid current of chlorine be conveyed through a tube filled with oxide of mercury, the appearances are exactly as in the first case; and only when the tube is kept sufficiently cool, or the evolution of chlorine rendered very slow, is much hyperchlorous acid obtained. When oxide of mercury, cal-



cined at  $752^{\circ}$  F., is employed, the action is less violent, and a greater amount is completely converted into hyperchlorous acid without any artificial cooling. In case the operation is conducted in a tube the current of chlorine should not be too rapid\*.

The precautions necessary for the success of Gay-Lussac's method of preparing hyperchlorous acid, are apparent from what has been stated above. But this method, when it is desired to employ the gas, has the further disadvantage, that on opening the balloon the gas mixes immediately with atmospheric air, as the hyperchlorous acid only occupies half the volume of the chlorine; and, moreover, the gas is here in contact with oxide, perchloride or oxichloride of mercury. All these evils are avoided if the chlorine gas be first passed through a washing flask, then through a tube of chloride of calcium, after which through a tube containing oxide of mercury, and the latter tube be connected with a narrower one reaching to the bottom of the flask to be filled with the gas. The hyperchlorous acid gas expels the air from the flask without mixing with it.

Hyperchlorous acid gas becomes liquid at  $-4^{\circ}$  F. at the usual atmospheric pressure. The liquid is blood-red, has a penetrating smell of chlorine, and somewhat resembling iodine, excites the eyes violently and the respiratory organs, boils at  $-2^{\circ}$ , and is converted into reddish-yellow vapours (even the purest hyperchlorous acid gas is not colourless); it is heavier than water, and dissolves only slowly in it with an orange colour. Arsenic, phosphorus, potassium, burn in liquid and gaseous hyperchlorous acid with flame, so does finely powdered antimony; but the acid may be distilled at  $+68^{\circ}$  over coarse grains of antimony without change. The liquid acid detonates by shaking and heat (for instance drawing a file on the margin of the glass). If the gas is conveyed into water, this latter does not become coloured at first; but subsequently, when 8 to 10 volumes have been absorbed, it acquires a yellow tint, and the more so the greater the degree of concentration. The orange-red solution is not decolorized by shaking with oxide of mercury.

When oxide of mercury is mixed with water of from  $+36^{\circ}$  to  $38^{\circ}$ , in which crystals of hydrate of chlorine are suspended, these latter disappear, the liquid becomes yellow, and contains hyperchlorous acid; also when gaseous chlorine is conveyed into *cold* water in which oxide of mercury has been suspended, a yellow solution is obtained. If then Gay-Lussac calls hypochlorous acid colourless, this can arise from his having only examined weak solutions; the above experiments entirely exclude any thought of the colouring arising from chlorine. Gay-Lussac also examined the gas in too thin layers.

Hyperchlorous acid is far more soluble in water than has been supposed; it absorbs 200 volumes at  $32^{\circ}$ . 1 cub. centim. of this solution decolorizes 400 cub. cent. of the normal solution of arsenic

\* The author explains this different action of the oxide of mercury, by admitting an amorphous and a crystalline oxide, of which only the former is easily converted into hyperchlorous acid. Crystalline basic sulphate of mercury scarcely affords with chlorine a trace of hyperchlorous acid.



of Gay-Lussac, and has therefore 40,000 chlorometric degrees, since its specific weight is 2.977. A litre weighs at 32° and 0<sup>m</sup>.760 barom., 3.864 grs.; 100 grs. water absorb, therefore, when completely saturated, 77.364 grs. hyperchlorous acid. The proportion is about 6 equiv. water to 1 equiv. acid. The solution has the same smell as the bleaching salts, only far more intense; it has a very caustic action on the skin; arsenic burns in it with a blue flame; antimony decomposes it; muriatic acid, ammonia, oxalic acid, produce violent effervescence; arsenious acid becomes oxidized in it with slight detonations forming arsenic acid; sulphuret of lead is quickly converted into sulphate of lead even by very dilute solutions, which may therefore be recommended for washing white oil colours which have become brown; salts of the protoxide of manganese are immediately changed into peroxide of manganese; from lead salts brown peroxide is precipitated, and these reactions may be employed to advantage in obtaining the two peroxides in a state of very fine division. In the case of peroxide of lead a dilute solution of the basic acetate is most to be recommended. Chloride of silver decomposes the aqueous hyperchlorous acid, and when muriatic acid is added in drops to the aqueous hyperchlorous acid at a temperature of 36° to 38°, a very abundant crop of crystals of the hydrate of chlorine is obtained.—*Comptes Rendus*, xvi. p. 43.

*On the Discovery of Native Lead in Ireland.*

In the March Number of the Philosophical Magazine Mr. Austin states, that in the autumn of the year 1839, whilst engaged in a mineralogical examination of a part of the country in the neighbourhood of Kenmare, County Kerry, he discovered a few specimens of this rare mineral in the carboniferous limestone of that district; and more recently, when surveying in the vicinity of Bristol, he has succeeded in obtaining it in tolerable abundance from the same formation in several localities. It occurs either coating the faces of the minor joints, or filling up small crannies at the points where several joints intercept each other; in the latter situations the pieces sometimes weigh nearly half an ounce, in others it appears merely as a fine film.

This interesting mineral has been described as occurring in small masses in the lavas of Madeira and other volcanic districts, and also as existing under very dubious circumstances at Alston in Cumberland, in minute globules in the interior of small lumps of *slaggy galena* within reach of the surface.

*On the Existence of Bromine and Iodine in the Fucus crispus.*  
By M. DUPASQUIER.

This plant is frequently prescribed in the form of a gelatine as a pectoral and nutritive substance. The author, in a paper published in the 'Journal de Pharmacie' for Feb. 1843, has shown that it is not simply a gelatinous and analeptic substance, as it contains



a very considerable quantity of iodine and of bromine in the state of iodide and bromide; and moreover that it is impregnated with much sulphate of soda, which on the carbonization of the plant is converted into the sulphuret of sodium, and thus prevents the presence of the iodine and bromine being easily detected.

It is very easy to prove the simultaneous existence of iodine and of bromine by a single experiment, and with a small quantity of a marine substance which does not contain any alkaline sulphate; it is only necessary to treat the aqueous decoction of its ash, after having previously conveyed some starch into it, by æther and chlorine or nitric acid, when a blue solution of iodide of starch is obtained, on which floats a reddish layer of bromiferous æther. But in examining the *Fucus crispus*, or any other marine substance impregnated as is this plant with an alkaline sulphate, it is first requisite to destroy the sulphuret contained in the decoction resulting from the ash by sulphate of zinc. After this operation, which is indispensable, not the least difficulty is met with in ascertaining and demonstrating the presence of the iodine and bromine.—*Journ. de Pharm.* for Feb. 1843.

*Case of Poisoning with Nux Vomica.* By Dr. LEONHARD.

A lady, 50 years of age, of delicate constitution, and long subject to abdominal affections, after having tried a vast number of medicines, was put upon a mixture of 1 drachm of the tincture of nux vomica to 2 oz. of menstruum, a teaspoonful to be taken three times a-day. Scarcely had the patient taken the first dose of her new medicine, however, than she was seized with very alarming symptoms. She had first a violent shivering fit; then the face became flushed; the eyes were set fast in the head; the features distorted; the mouth close shut, the teeth being ground from time to time; the breathing was rapid, noisy, interrupted. The patient was in agony, suffered from violent palpitation, and frequently screamed aloud; at the same time the head was drawn forcibly backwards, and the mouth widely opened; the tongue was projected from the mouth, and then, by the convulsive snapping together of the jaws, severely wounded. The patient swallowed fluids reluctantly and with great difficulty; sometimes she could not swallow at all. The patient was obviously suffering from an over-dose of some medicine containing strychnine. As vomiting had already been produced the liquor ammonii anisatus was had recourse to, first in doses of from 20 to 30 drops in a little sugar and water, at first every five, and then every ten or fifteen minutes. Under the use of this medicine all the alarming symptoms rapidly subsided, and the patient finally recovered. On questioning the apothecary's lad, who had made up the medicine, as to what he had done, he at first declared that he did not know how strong the tincture of nux vomica was which he had dispensed, or what other article he had substituted for it; but some hours later he owned, that instead of the *drachm of the tincture*, he had, through an "unhappy mistake," substituted *two*



*drachms of the spirituous extract of nux vomica!*—*Medicin. Zeitung vom Preuss. Verein*, No. 50, Dec. 1842, and *Lond. and Edinb. Monthly Journal of Medical Science*, April 1843.

### *Quantity of Carbonic Acid exhaled during Respiration.*

M. Andral read before the Academy of Sciences a memoir on the quantity of carbonic acid exhaled during respiration. The following are the conclusions at which the author arrives:—

1. The quantity of carbonic acid exhaled in a given time by the lungs varies according to the age, sex and constitution of the individual.

2. In both male and female this quantity varies with the age, and the variation is independent of the weight of the individual.

3. At every period of life, from eight years to advanced old age, the quantity of carbonic acid exhaled from the lungs of the male in a given time is, *cæteris paribus*, always more than that furnished by the female. This difference is particularly well marked between the ages of sixteen and forty, during which period the male exhales nearly twice as much carbonic acid as the female.

4. In the male the quantity gradually increases from eight to thirty years, and it is increased suddenly, and in a considerable degree, at the period of puberty. After thirty the quantity of carbonic acid begins to decline, and the decrement is greater in proportion as extreme old age approaches; so that, at the latter period, the quantity may fall to what it was at the age of ten years.

5. In the female the exhalation of carbonic acid follows the same law of increment during the period of childhood; but as soon as menstruation commences the increase of this exhalation is suddenly arrested, and it remains stationary during the period over which the function of menstruation extends. When the woman ceases to menstruate exhalation is suddenly increased; and it declines with old age as in the male.

6. During the whole period of pregnancy, the exhalation of carbonic acid is raised to the standard peculiar to women at the critical period of life.

7. In both sexes, and at all ages, the quantity exhaled is great in proportion to the strength of the constitution and the development of the muscular system. This fact is confirmed by experiments of a different kind, showing that weakness of the constitution produced by disease is attended by diminution in the quantity of carbonic acid exhaled.

The considerable variations now noticed do not depend only, as might be thought, on the differences in the capacity of the chest.—*London and Edinb. Monthly Journ. of Med. Science*, April 1843.

### *On the Stannates.*

Berzelius has, in his 'Jahresbericht,' vol. xxii., drawn attention to a very excellent paper on the Stannates by M. Moberg, which,



although published four years ago, had hitherto escaped the notice of chemists. Hydrated oxide of tin, or rather stannate of water, consists of  $\text{H O} + \text{Sn O}^2$ , and it forms the type of the degree of saturation of the oxide of tin as acid.

*Potash Salt*.—When the hydrate of the oxide of tin is dissolved in caustic potash, and the solution evaporated in vacuum to a somewhat syrupy consistence, the stannate of potash separates in crystals, the primitive form of which is an oblique rhombic prism with very acute angles sometimes replaced by surfaces. The best crystals are obtained from a less concentrated solution on slow evaporation. They are colourless, shining, have a caustic alkaline taste, dissolve easily in cold and in warm water, do not deliquesce when exposed to the atmosphere, but absorb carbonic acid. They consist of  $\text{KO SnO}^2 + 3 \text{ aq.}$

The *soda salt* is obtained in the same manner, but it crystallizes with greater difficulty from its being more easily soluble. It forms six-sided prisms, which consist of  $\text{Na O Sn O}^2 + 3 \text{ aq.}$

The *ammonia salt* is obtained when the moist hydrate is dissolved in caustic ammonia to perfect saturation, and the solution evaporated over sulphuric acid. It dries to a yellowish gelatinous mass, which consists of  $\text{N H}^4 \text{ O} + \text{Sn O}^2$ . It is therefore a bistannate. When a solution of the stannate of potash is mixed with chloride of ammonium, a white gelatine is precipitated, which could not be analysed from its being dissolved on edulcoration.

The *barytes salt* is best prepared by precipitating the potash salt with chloride of barium. It is a white heavy powder, which consists of  $\text{BaO SnO}^2 + 6 \text{ aq.}$

The *lime salt*, prepared in the same manner, is not so readily deposited. It is colourless, and  $= \text{CaO SnO}^2 + 4 \text{ aq.}$

The *magnesia salt* is precipitated in the form of a magma, which stops up the filter and cannot be washed.

The *protoxide of manganese salt* is also precipitated free from colour, but becomes yellow in the air.

The *oxide of zinc salt* is thrown down white, and is  $\text{ZnO SnO}^2 + 2 \text{ aq.}$

The *oxide of lead salt* is precipitated of a white colour, but only in small quantity, and it appears to be for the greater part soluble in the liquid.

The *oxide of copper salt* is precipitated green, and is  $\text{CuO SnO}^2 + 3 \text{ aq.}$

The salt of the *protoxide of mercury* is at first yellow, but soon acquires a green tint, and after a time becomes dark green. It contains 5 atoms water.

The salt of the *oxide of mercury* is at first white, then becomes dark green, and consists of  $\text{HgO SnO}^2 + 6 \text{ aq.}$

#### *On the Decomposition and Disintegration of Phosphatic Vesical Calculi. By Dr. Hoskins.*

A very interesting paper was recently communicated to the Royal Society by Dr. E. Hoskins, entitled:—"Researches on the



Decomposition and Disintegration of Phosphatic Vesical Calculi; and on the introduction of Chemical Decomponents into the living Bladder."

The object of these researches was the discovery of some chemical agent, more energetic in its action on certain varieties of human calculi, and less irritating when injected into the bladder, than any of the fluids hitherto employed.

These indications not being fulfilled by dilute acids, or other solvents which act by the exertion of single elective affinity, the author investigated the effects of complex affinity in producing decomposition, and consequent disintegration, of vesical calculi.

For this purpose an agent is required, the base of which should unite with the acid of the calculus, whilst the acid of the former should combine and form soluble salts with the base of the latter. The combined acids would thereby be set free in definite proportions, to be neutralized in their nascent state, and removed out of the sphere of action, before any stimulating effect could be exerted on the animal tissue.

These intentions the author considers as having been fulfilled by the employment of weak solutions of some of the vegetable super-salts of lead; such as the supermalate, saccharate, lactate, &c. The preparation, however, to which he gives the preference, is an acid saccharate, or, as he calls it, a *nitro-saccharate of lead*.

The salt, whichever it may be, must be moistened with a few drops of acetic, or of its own proper acid, previous to solution in water, whereby alone perfect transparency and activity are secured. He furthermore states, that the decomposing liquid should not exceed in strength one grain of the salt to each fluid-ounce of water, as the decomposing effect is in an inverse ratio to its strength.

Having by experiments which are fully detailed ascertained the chemical effects of the above class of decomponents on calculous concretions *out of the body*, the author briefly alludes to the cases of three patients, in each of whom from four to eight ounces of these solutions had been repeatedly, for weeks together, introduced into the bladder, and retained in that organ without inconvenience for the space of from ten to fifty minutes.

It not being the intention of the author to enter into the medical history of these cases, he merely cites the above facts as sufficient to establish the principle originally laid down; namely, chemical decomposition of phosphatic calculi, by means of solutions so mild as to be capable of retention in the living human bladder without irritation or inconvenience.

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## ANALYTICAL CHEMISTRY.

*On some Separations effected by the Means of Sulphurous Acid or of the Alkaline Sulphites.* By M. P. BERTHIER.

[Concluded from p. 294.]

WE now proceed to detail some processes of separation in analysis founded on the facts described in our last.



*Alumina* from *Glucina*.—These two earths occur together in the emerald, and in some other minerals, and have frequently to be separated in the preparation of pure glucina. When they have been dissolved in sulphuric acid, the greater portion of the alumina may be got rid of by converting it into alum by the addition of an adequate quantity of sulphate of ammonia to the concentrated solution; after which sulphite of ammonia is added in excess to the decanted and diluted liquid, and boiled until all liberation of sulphurous acid ceases. The alumina is entirely precipitated, while the glucina remains in solution, and may then be precipitated by ammonia; or both substances may be precipitated with ammonia, and while moist treated with sulphurous acid, which will redissolve both. On boiling the solution the alumina is completely separated.

*Alumina* may be separated from *magnesia* in the same manner.

*Yttria* and *cerium* may also be separated by the same process from *glucina*.

*Alumina* or *Yttria* from *Iron*.—Sulphite of ammonia is added to the solution, or the mixture of the moist hydrates treated with sulphurous acid. On boiling, the liquid, which previously was of a reddish-brown colour, however small the quantity of iron, becomes colourless, the alumina or yttria is deposited, and the iron alone remains in solution. It is however necessary to use some precaution in filtering the solution, as the action of the atmosphere might occasion an ochreous deposit which would contaminate the earth. The solution is therefore boiled in a flask with a narrow neck, and when no more sulphurous acid is disengaged, it is nearly filled with boiling water and corked. When it has become cold the liquid is decanted on to a filter and replaced by boiling water, and finally filtered andedulcorated. If the iron contained any quantity of phosphoric acid this is carried down by the earth, but with arsenic acid it is the reverse.

*Alumina* or *Yttria* from *Manganese*, *Cobalt* or *Nickel*.—Sulphite of ammonia is added to the solution, which is then boiled; only the earths are precipitated.

*Zircona* or *Titanic Acid* from *Iron*.—To purify a precipitate of zircona or titanica acid which contains a small quantity of iron, the direct action of sulphurous acid cannot be made use of; the iron must either be first converted into the protosulphuret, or sulphite of ammonia, which is far preferable, be employed. For this purpose the precipitate is dissolved in muriatic acid, then neutralized as exactly as possible with ammonia, and sulphite of ammonia added, when it is boiled until all opalescence ceases; it is then filtered with the necessary precautions. The whole of the iron remains in solution, but not a trace of zircona or titanium.

*Uranium* from *Iron*, *Manganese*, *Cobalt*, *Nickel* or *Zinc*.—Uranium is separated from all these metals by boiling the solution after the addition of sulphite of ammonia. The iron might also be separated, but only the iron, by precipitating the two metals with an alkaline carbonate, redissolving the precipitate with sulphurous acid



and boiling; the iron would remain in the solution. If the uranium contain but very small quantities of manganese, cobalt, nickel or zinc, they may also be separated in this manner, and will remain in solution.

*Chromium from Iron.*—To separate these two metals they are precipitated with ammonia or the carbonate, and the moist precipitate treated with a slight excess of sulphurous acid; the whole of the iron dissolves, and also a certain quantity of the oxide of chromium, while the remainder of this latter metal is converted into pure subsulphite. The solution is boiled until it is decolorized, when it only contains iron. To precipitate this metal the sulphurous acid is expelled either by sulphuric acid or aqua regia, and then an alkali or alkaline carbonate added; or the iron is thrown down by an alkaline hydrosulphate without decomposing the sulphite.

When a solution of oxide of chromium contains at the same time a sufficient quantity of alumina, the whole of the oxide of chromium is carried down by the earth when precipitated with sulphite of ammonia. This affords a means of separating chromium from iron, manganese, &c. The metals being dissolved, any solution of alumina, for instance of alum, is added, and then sulphite of ammonia; it is now boiled until opalescence ceases, filtered, and if it should still retain a green tint, more alum and sulphite of ammonia added, &c. The precipitate contains the whole of the oxide of chromium and of the alumina, without a trace of the other oxides; on treating it in the cold with caustic potash it dissolves entirely, but on boiling the oxide of chromium is completely separated.

*Phosphate of Iron.*—It is dissolved in muriatic acid, sulphurous acid, sulphite of ammonia and a sufficient quantity of alum added to the solution, which is then boiled; the alumina is precipitated, and carries down with it the phosphoric acid. If arsenic be present, it remains wholly in solution in the state of arsenious acid.

*Copper from Iron, Manganese, Nickel or Zinc.*—On adding an excess of sulphite of ammonia to the solution of these metals, and then boiling, the copper only is precipitated in the state of the red subsulphite. This process might be employed in analysing brass; after the separation of the copper the zinc would be precipitated by a hydrosulphate, &c.

*Phosphate or Arseniate of Copper.*—These salts are dissolved in hydrochloric acid, and the solution boiled with sulphite of ammonia; the copper is thrown down as red subsulphite, and only the least trace remains in the liquid.

*Phosphate and Arseniate of Lead* might be analysed in the same manner after solution in nitric acid.

*Tin from Iron.*—After solution in hydrochloric acid, dilution with water, and neutralization with ammonia, sulphite of ammonia is added; the whole of the tin is precipitated, while the iron remains in the liquid.

*Tin from Antimony.*—The two metals being dissolved in concentrated muriatic acid, tartaric acid is added to the solution, which is



then diluted with water, sulphite of ammonia added and boiled; the tin is precipitated, the antimony remains dissolved.

*Gold from Copper.*—Gold might be separated from copper by means of sulphurous acid. On boiling the solution the gold would collect in scales, sulphurous acid would be evolved, and the copper salt would remain unaltered, rendered slightly acid from the formation of a certain quantity of sulphuric acid.

*Gold from Platinum.*—The same process might be employed in analysing an alloy of gold and platinum.—*Ann. de Chem. et de Phys.* for Feb. 1843.

#### *Separation of Gold from Platinum.*

The relative proportion of these two metals in an alloy may easily be determined by dissolving in *aqua regia*, reducing the gold by oxalic acid, and then throwing down the platinum, which is not affected by this acid in a metallic state by means of formic acid.—Dingler's *Journ.*, 1842, p. 248.

#### *On the Detection of Phosphoric Acid in the Alkaline Earthy Phosphates.*

According to Liebig, the compound should be dissolved in muriatic acid, perchloride of iron added, and then ammonia, which should produce a *reddish-brown* precipitate; the solution contains the alkaline earth in the state of a metallic chloride. The precipitate is digested with sulphuret of ammonium, by which sulphuret of iron and phosphate of ammonia are obtained; the phosphoric acid is then easily detected in this combination by the addition of a salt of magnesia.

## PHARMACOLOGY.

### *On Radix Ginseng.*

IN a former Number we published a notice of this remarkable root, to which so many valuable properties are ascribed. The following account, taken from Dr. O'Shaughnessy's valuable 'Bengal Dispensatory,' will serve to complete our previous communication.

The roots of this plant (*Panax quinquefolius*, *Aureliana canadensis*, *Ginseng*) are about the thickness of the finger, like those of parsley, of whitish-yellow colour externally, white within, two to three inches long, wrinkled, or with rings, often divided into two branches, rarely into three or four, and then presenting a slight likeness to the human form, whence the Chinese name is derived. The parenchyme is formed of a horny and compact tissue, displaying some resinous points. Above the neck is a knotted, twisted tissue, formed by the remains of the old stalks. The odour is sweet and weakly aromatic; the taste saccharine, somewhat like that of liquorice, subsequently bitter and rather aromatic.

The root of an umbelliferous plant, the *Sium Ninsi*, is often



mixed in the druggists' shops, or mistaken otherwise for the ginseng. The essential difference consists in the ginseng having the neck covered with fibrous threads, the remnants of the cortical part of the stalk.

The root abounds in gum and starch, and has a little resin and essential oil.

The plant is about a foot high, with glabrous, straight simple stalks, terminating in three leaves, each composed of six uneven leaflets, a little pedicelled, oval, lanceolate, acute, and toothed at the edge. The flowers are borne on a central peduncle, and disposed in an umbel. The berries are kidney-shaped, red, compressed, crowned with the calyx and styles, and containing two semicircular seeds.

The ginseng root is one of the substances which, without any obvious cause, has attained the highest celebrity and esteem among mankind for its alleged medicinal virtues. The Dutch were the first nation who made it known in Europe, where they brought it from Japan in 1140. The Japanese themselves were indebted for it to China. The plant grows in the great forests of Tartary, between the 39th and 47th degrees of north latitude. It is also found in abundance in Virginia and Canada, a circumstance which has rendered the roots so common that they are now cheap in China, where they once sold for their weight in gold.

It would be superfluous to follow M. Fée and other authorities in the details they afford regarding the cultivation and gathering of the ginseng. The Chinese, in their hyperbolical phraseology, name the root the "pure spirit of the earth," the "recipe of immortality," and the "queen of plants," &c.; and, in short, regard it as a panacea for all diseases to which they are liable.

Dr. Wallich has discovered in Nepal a species of *Panax* closely allied to our present article, and of which he has published an account in the 4th volume of the Transactions of the Med. and Phys. Society of Calcutta. Dr. Wallich names his species *P. pseudo-ginseng*.

### • Paraguay Tea.

The tea tree, called the *Yerva Mate*, grows spontaneously, intermingled with the vegetable productions of the country, in the magnificent forests which abound in the neighbourhood of the streams which fall into the Parana and Uruguay. Paraguay is rich in its forests, which contain numerous species of fine timber trees, many of which yield gums, caoutchouc, materials for dyeing, and in the midst of these the Maté rises to the size of the common orange-tree. These forests, from their production of this herb, are called yerbales; the country in their immediate neighbourhood is without cultivation, and is overgrown with thorny Acacias and underwood of every kind. The tree becomes stunted when the leaf is regularly gathered, for the limbs are cut every two or three years. The leaf is from four to five inches long, is elliptic, cuniform, crenated, of a dark green above, and paler below. The method of preparing the tea is as



follows:—A hurdle of long poles is constructed in the form of a cylindrical vault, which they call *barbagua*; under this a large fire is made, and the branches, being placed on the hurdle, remain there till the leaves are dry; after this they remove the fire, and on the hot and hard platform, after being swept clean, they throw the branches, which they beat to separate the leaves. In this each is assisted by a boy, who receives the proportion of 25 lbs. of leaves for every bundle he cleans. The leaves, being separated from the branches, and prepared sufficiently, are next put into a large bag made of hides, which has the four upper corners fixed to four large stakes placed in the ground, fitted to support a considerable weight; into this they put the leaves, and beat them down with a pole in the same way as the negroes of the West Indies pack their cotton bags. When the bag is filled and packed hard, the mouth is sewed up, and in this state, without further preparation, the leaves are fit for use, but not considered as seasoned till they are a few months old. In the form in which the tea is imported into this country, it is quite impossible to trace the minutest form of a leaf, for it has the appearance of a highly comminuted powder; and indeed this is one of the reasons why it must be quaffed, and not drunk. The infusion is made by putting into a sort of tea-pot a handful of the *maté*; when this is poured into a cup, the tea-drinker is furnished with a little instrument, a tube with a bulb perforated with a number of small holes. This bulb is placed in the liquid, and then the process of suction is commenced. Many individuals who have been in the habit of using it, ascribe singular virtues to it: some it renders tranquil under circumstances of agitation, whilst others feel a slight degree of excitement; but few seem to agree upon the subject. It would appear, from an analysis lately made of the leaves of the *Ilex Paraguayensis*, that the virtue resides in an alkali which is not dissimilar to the theine\*.—*Illustrated Polytechnic Review*.

#### *On the Species of Aloes.*

The late F. R. Nees von Esenbeck has detailed, in the second volume of the second edition of Geiger's 'Manual of Pharmacy,' the results of several inquiries which he had undertaken on the species of *Aloes*. According to him this genus may, from the form of its perianth, be separated into three divisions, which might even be considered as distinct genera:—1. *Aloe grandifloræ*, flowers large, erect, in the form of a tube or flask. 2. *Aloe curvifloræ*, flowers tubiform and curved (*Gasteria*, W.). 3. *Aloe parvifloræ* (*Apiera*, W.), flowers smaller, the limb with two irregular lips. The *Aloe vulgaris*, Lam. (*A. perfoliata*, L., *A. Barbadosensis*, Hawsley); the *A. Abyssinica*, Lam.; the *A. soccotrina*, Lam. (*A. perfoliata*, Var. L.); the *A. purpurescens*, Haw. (*A. rubescens*, Dec.); the *A. spicata*, Thunb., contain bitter juice, and are perhaps all important for the extraction of aloes. The *A. humilis*, Lam.; the *A. fera*, Dec.; the *A. ferox*, Lam.; the *A. subferox*, Spr., were also found to afford a very bitter juice and in great quantity. On the other hand, the

\* See our present Number, p. 332.—ED.



*A. glauca*, Mill.; the *A. paniculata*, Jacq.; the *A. saponaria*, Heur.; the *A. cæsia*, S. D.; the *A. plicatilis*, Mill.; the *A. arborescens*, Mill.; the *A. frutescens*, S. D., were but slightly bitter.

The species belonging to the divisions *Gasteria* and *Apiera* are provided with numerous resinous vessels, but do not contain any bitter juice.—*Journ. der Pharm.* for Feb. 1843.

*Notice of the African Grain called Fundi or Fundungi.*

By MR. CLARKE.

This Lilliputian grain, which is described by Mr. Clarke as being about the size of mignonette-seed, is stated to be cultivated in the village of Kissy and in the neighbourhood of Waterloo by industrious individuals of the Soosoo, Foulah, Bassa and Joloff nations, by whom it is called "hungry rice." The ground is cleared for its reception by burning down the copse-wood and hoeing between the roots and stumps. It is sown in the months of May and June, the ground being slightly opened and again lightly drawn together over the seed with a hoe. In August, when it shoots up, it is carefully weeded. It ripens in September, growing to the height of about eighteen inches, and its stems, which are very slender, are then bent to the earth by the mere weight of the grain. They are reaped with hooked knives. The patch of land is then either suffered to lie fallow, or planted with yams or cassada in rotation. Manure is said to be unnecessary or even injurious, the plant delighting in light soils and being raised even in rocky situations, which are most frequent in and about Kissy. When cut down it is tied up in small sheaves and placed in a dry situation within the hut, for if allowed to remain on the ground or to become wet the grains become agglutinated to their coverings. The grain is trodden out with the feet, and is then parched or dried in the sun to allow of the more easy removal of the chaff in the process of pounding, which is performed in wooden mortars. It is afterwards winnowed with a kind of cane fanner on mats.

In preparing this delicious grain for food, Mr. Clarke states that it is first thrown into boiling water, in which it is assiduously stirred for a few minutes. The water is then poured off and the natives add to it palm oil, butter or milk; but the Europeans and negroes connected with the colony stew it with fowl, fish or mutton, adding a small piece of salt pork for the sake of flavour, and the dish thus prepared is stated to resemble kous-kous. The grain is also made into a pudding with the usual condiments, and eaten either hot or cold with milk; the Scotch residents sometimes dressing it as milk-porridge. Mr. Clarke is of opinion that if the fundi grain were raised for exportation to Europe, it might prove a valuable addition to the list of light farinaceous articles of food in use among the delicate or convalescent.

Specimens of the grass have been examined by Mr. Kippist, Librarian to the Linnæan Society. It is a slender grass with digitate spikes, which has much of the habit of *Digitaria*, but which, on account of the absence of the small outer glume existing in that



genus, must be referred to *Paspalum*. Mr. Kippist regards it as an undescribed species, and distinguishes it by the name of *Paspalum exile*.—*Proceedings of Linn. Soc.*

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## CHEMICAL PREPARATIONS.

*On the Preparation and Properties of Solanine.*

By M. WACKENRODER.

THE following is the author's process :—The potatoe apples, which are best collected at the commencement of June, are broken slightly in the hand, then placed in a large basin, which is entirely filled with them. Some heavy stones are placed on them, and they are then treated with so much water acidulated with sulphuric acid as to cover them. A somewhat considerable quantity of sulphuric acid is added to the water, so that during the maceration the liquid retains a *strong* acid reaction. It is remarkable that to attain this a larger quantity of acid is requisite than would be expected; the saturation however of the acid does not depend on any considerable amount of ammonia in the apples. After 12 to 18 hours of cold maceration, the apples appear more or less soft; they are pressed with the hands and thrown away. The turbid acid extract is again poured on to two successive quantities of fresh apples, some more sulphuric acid having been previously added to it, and after having been left to macerate for the same length of time, is separated in the same manner. It is now turbid and slightly mucous, has more a bitter than an acid taste, and after having stood quiet for some days becomes perfectly clear, and can be filtered with ease through linen. The liquid which passes through is generally somewhat brown. Pulverized hydrate of lime is added to it in small excess; this colours it blue, then greenish and red, and lastly brown, as when a solution of tannic acid is treated with an excess of lime water. The lime precipitate gradually acquires a yellow colour; after about 24 hours it is separated by a linen strainer and dried by exposure to warm air. Not a trace of solanine is contained in the liquid.

The lime precipitate has a gray, or sometimes a yellowish-white colour, when it contains a larger quantity of gypsum or hydrate of lime than is necessary. It is powdered and boiled several times with alcohol of 0·851 in a large flask. The hot alcoholic extract was at first colourless, and only became slightly yellowish in the subsequent extractions. The first and second extract were so saturated with solanine, that it crystallized immediately for the most part in laminæ and scales on the filter. A copious precipitation of stearine-like flakes was also deposited in the filtered solution. When quite cold, the sides of the vessel were coated with little aggregations of crystals, such as are seen to form sometimes in an alcoholic solution of stearine. The alcohol, and also the subsequent extracts from the lime precipitate, from which in the cold no solanine was deposited, were distilled down to about a fourth of the volume. On cooling,



the residuary yellowish liquid solidified entirely to a yellowish gelatinous solid cake resembling opodeldoc. This gelatinous solanine amounted apparently to more than that obtained in the crystalline state; on drying a small portion of it, it passed into a transparent horn-like amorphous mass.

Otto endeavoured in vain to convert the gelatinous solanine into crystalline, and Reuling recommended the use of ammonia for this purpose. The author believes that the cause of the gelatinous state of the solanine must not be ascribed merely to the presence of an extractive or perhaps fatty substance, but that it may occur in two distinct states of aggregation, perhaps in consequence of a different amount of water.

The solanine which had separated on filtration formed when dried crystalline laminæ and scales; it was redissolved in boiling alcohol of 0.851 sp. gr., to separate it from any admixture of lime. On cooling, a portion of the solanine was deposited in the state of a perfectly white crystalline powder, which beneath the microscope had the appearance of a tissue of loose, more or less distinct, imperfect flat prisms. In these crystals some small opaque spots are always apparent. The behaviour of this crystallized solanine, which must be considered as the perfectly pure alkaloid, towards solid iodine or its solution is very characteristic, the solution of the solanine being coloured in an instant of a deep brown or brown-yellow. Scarcely less characteristic is the colouring produced by the hydrated sulphuric acid; the reddish-yellow solution becomes on standing of a purple-violet, then brown, and at last colourless, with deposition of a brown powder. Solanine is dissolved, yielding a nearly colourless solution, by concentrated nitric acid; on being exposed to the air for a time it becomes of a rose-red and then brownish. This liquor, from which the crystallized solanine had separated, left behind on distillation the alkaloid which had remained dissolved, in a gelatinous state; when dried, it formed a slightly yellowish, hard, brittle, perfectly amorphous mass, which did not differ in the least in its behaviour towards reagents from the crystalline variety.

The solanine, which had separated from the hot alcoholic extract of the solanine-lime in abundant flakes, appeared after edulcoration with cold alcohol and perfect desiccation under the recipient of the air-pump, as a white, at some places only faintly yellow, earthy and amorphous substance. It was easily pulverized, and afforded a loose white powder. With the exception of a very slight trace of a colouring substance, no chemical difference between this and the crystallized solanine could be perceived.

The portion which, after removing the alcohol, had remained behind in a state resembling opodeldoc, was very slightly coloured yellowish; to purify it completely, and at the same time to convert it into the crystalline state, it was heated with alcohol of 0.851 sp. grav.; it dissolved with difficulty, evidently from the hydrate-water diminishing the solubility of the solanine in the spirit. The yellowish solution deposited however on cooling a good quantity of gelatinous solanine: after pressing between blotting-paper, it dried by ex-



posure to the air to a light gray, almost transparent, gummy mass, covered here and there with white crystalline spots, which under the microscope proved to be heaps of imperfect crystals. The portion which had remained in solution was separated for the greater part by the addition of an equal volume of water in white voluminous flakes, which however on drying very slowly on the filter became converted into a yellowish, transparent, brittle, horny mass, with an even cleavage. On concentrating the diluted alcoholic liquid, it became covered with a slightly brownish-yellow pellicle, which proved to be large scales of solanine, in which however not a trace of crystallization could be detected. A considerable quantity of the alkaloid still remained in the yellow liquid.

It is evident that the gelatinous solanine can, by mere treatment with alcohol, be converted for the greater part into amorphous solanine; but it also affords some crystalline solanine. Some similar experiments were made with the dried, gummy, light gray solanine above mentioned. When boiled with alcohol of 0.851 spec. grav. it dissolved with great difficulty, and from the hot filtered solution abundant flakes separated on cooling, which when dried appeared under the microscope as a pulverulent crystalline mass with some flat prisms scattered through it. When a drop of the solution was evaporated on a piece of glass, the spot exhibited a dense linear arrangement of white granules and no crystals. It is evident therefore that the crystalline nature of the solanine must partly depend on the mode of separation from its alcoholic solution; it cannot be regarded as a requisite character of pure solanine any more than is the case with catechuic acid. Like this acid the amorphous solanine combines with water forming an actual or apparent hydrate. When the gummy or horn-like solanine is digested with water, it gradually affords a white milky liquid, which froths very much on shaking. When the dried gummy solanine is boiled with alcohol of 0.851 sp. grav., very little of it is dissolved; it separates on cooling partly in granules, partly in flakes, which when dried on a filter exhibit a crystalline structure, and even some flat prisms. When the solanine which remained undissolved was treated with sulphuric acid, precipitated with lime, and now dissolved in hot alcohol, a crystalline gelatine separated on cooling, some of which, dried on a plate of glass, afforded a white powder, which appeared under the microscope indistinctly crystalline. Another portion of this gelatine was shaken with alcohol of 0.833 spec. grav. The slight solubility of solanine in such strong spirits rendered easier the separation of the gelatine, which dried into pellicles and granules.

Similar experiments were made with the yellow amorphous solanine, in order to convert it, by mere treatment with alcohol, into the crystalline state. It was found however that the adhering yellow colouring substance greatly, if not entirely prevented crystallization. This colouring matter may be partially removed by treating the gelatine with ammoniacal alcohol, or, what is better, with lime. The latter process indeed is the only one possible when the gelatine has been once dried. The solanine is dissolved in dilute sulphuric acid,



and the hydrate of lime added, but not in too large quantity; it is then completely precipitated, and is extracted with hot alcohol of 0.851. The liquid from the first boiling is colourless, and on cooling the solanine separates either in flakes, which when dry appear crystalline, or as a gelatine, which is converted by drying into a powder.

Some experiments were also made to convert the pure crystalline solanine, by mere boiling in alcohol, into amorphous. In fact, when the pure white pulverulent solanine, which appeared under the microscope to consist of imperfect flat prisms, was dissolved in acid alcohol, only a very small portion of it could be obtained again in a crystalline state. The greater portion formed a gelatine, especially after slow evaporation of the alcohol.

The tendency of solanine to separate in minute granules, which appear amorphous even when strongly magnified, deserves notice. They not only appear in the gelatinous residue on the evaporation of the alcoholic solution on a glass plate, but more or less frequent even on the prismatic crystals. They do not appear to be owing to any foreign substance. The disagreeable nauseous smell which solanine, more especially that not perfectly white, offers on its solution in sulphuric acid, and also on boiling it with alcohol, may however not be peculiar to this alkaloid.—*Archiv der Pharm.*, xxxiii. p. 59–68.

#### *Preparation of Oxide of Chromium.*

According to G. Böttcher, very pure oxide of chromium may be obtained by the ignition of 240 parts in weight of bichromate of potash, 32 lime-tree charcoal, 10 nitre, 5 sulphur, and 5 sal-ammoniac.

Crystalline chromic acid behaves very peculiarly towards absolute alcohol. This latter becomes inflamed, and is converted into aldehyde, while the chromic acid becomes incandescent and is reduced to oxide of chromium, presenting at the same time one of the most brilliant appearances.—*Arch. der Pharm.*, Feb. 1843.

#### *Adulteration of Epsom Salts.*

Epsom salts are frequently adulterated with sulphate of soda, sometimes to the extent of 35 per cent. To detect this, the solution is treated with acetate of barytes, the liquid evaporated to dryness, and the residue ignited and treated with water, which extracts the carbonate of soda, and leaves the carbonate of magnesia behind.—*Jahrb. für Prakt. Pharm.*, 1842.

#### *Platinum Sponge.*

Kastner advises precipitating platinum solution with sulphuretted hydrogen, and allowing the precipitated sulphuret to change by long contact with the atmosphere into metallic platinum and sulphuric acid, which is very easily removed by washing.—*Arch. der Pharm.*, Feb. 1843.



*On the Conservation of Mist. Ferri Comp.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

GENTLEMEN,

If it will not be trespassing too much on your space, a few remarks on an article which appeared in the last Number of your valuable Journal, on the "Conservation of *Mistura Ferri Comp.*," may prove of service to some of your readers. If kept prepared as your Correspondent suggests, the action of the potash on the myrrh soon forms a saponaceous compound; the iron in solution rapidly absorbs oxygen, and is converted into the red oxide. The mixture, when thus prepared, is of a reddish-yellow colour, its efficacy diminished, and from the difference in appearance which it presents to that which it exhibits when recently compounded, the patient would naturally suppose that some mistake had occurred. We use large quantities, prepared according to the following formula, which is nearly as expeditious, and produces a nice green mixture:—

Solutio pro *Mistura Ferri Comp.*

℞ Pulv. myrrhæ.  
 Pulv. sacch. alb. av. ʒiss.  
 Aquæ distill. ʒvj. tere bene et adde  
 Ess. rosæ, ʒiss.  
 Ol. myrist., gr. 40 in  
 Sp. tenuior, ʒij. solve, deinde adde  
 Aquæ q. s. pro ʒxij.

ʒj. of this solution added to Aquæ ʒvij. and

Potassæ subcarb., gr. xxxv.

Ferri sulph. ʒj. when required,

forms *Mistura Ferri Comp.* of the Pharmacopœia.

Maidstone, April 7th.

WILLIAM WICKHAM.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*On a new Manganese Test.* By M. A. LEVOL.

THE value of oxide of manganese in the arts always depends on the quantity of oxygen which it gives off in order to pass into the lowest stage of oxidation, or what amounts to the same, on the quantity of chlorine which it is capable of liberating from hydrochloric acid; it thence results that consumers frequently find it necessary to ascertain the one or the other of these points. Several very accurate and ingenious processes have been described for this purpose, but they all present some difficulties to the manipulator little exercised in laboratory experiments, and moreover their execution requires a somewhat considerable time. I have thought, and this is also the opinion of persons well acquainted with the wants of



manufacturers, that it would be useful to make known a new, simple and quick method for such cases, where it is of advantage to estimate quickly the value of a manganese, even if this were effected at the expense of a very accurate evaluation of its amount of oxygen.

This method, of which the following is the description, allows of ascertaining very easily, and at the most in half an hour, the value of any manganese to within half a chlorometric degree.

It is founded on these facts:—

Protochloride of iron, containing an excess of hydrochloric acid, affords not a trace of chlorine with a body capable of liberating that gas, so long as its affinity for chlorine has not been satisfied, or, in other words, until it has become perfectly converted into perchloride; and secondly, chlorate of potash, brought into contact with an excess of hydrochloric acid, with the application of heat liberates as many equivalents of chlorine as it contains equivalents of oxygen.

For the execution of this process it is requisite to have—

1. A flask of about 3-decilitres' capacity, with a short and somewhat broad neck capable of being closed with a cork, in which is situated a small straight funnel-tube drawn out at its lower end.

2. An aqueous solution of perfectly pure chlorate of potash, of which 100 grs. contain 1·829 gr. of this salt. According to theory and experiment, this solution of 100 grs. would give in the operation 3·170 grs. chlorine, or 100 chlorometric degrees.

Nothing is more simple than the manipulations. They consist, on the one hand, in weighing off 3·980 grs. of the manganese to be estimated. [This quantity, in the pure or normal state, is known to liberate from the hydrochloric acid exactly 1 litre of dry chlorine at 32°, and 0<sup>m</sup>·760, which weighs 3·170 grs. This quantity of chlorine represents 100 chlorometric degrees.] On the other hand, 4·858 grs. of thin and clean iron wire are weighed off. [This quantity of iron is capable, being converted to the state of protochloride, of absorbing, in order to pass into the perchloride, the whole of the chlorine which could be produced by means of 3·980 grs. of normal manganese\*.]

The iron is introduced into the flask, and from 80 to 100 grs. of pure and concentrated hydrochloric acid poured over it; the apparatus is closed with a cork, slightly cut on the sides to allow the hydrogen to escape without the air being able to pass in too easily. It is then gently warmed, to accelerate dissolution, after having

\* The traces of impurities contained in this iron have no considerable influence on the results of the test; nevertheless, if it were desired to take them into consideration, they might be calculated, from the statement of Berzelius, at 0·024 gr. ( $\frac{5}{10600}$ ), and consequently it would be necessary to take 4·882 grs. of iron instead of 4·858. This very process however affords a means of testing the purity of the substances employed, which consists in controlling the iron and the chlorate employed the one by the other. 4·858 grs. of pure iron, converted into protochloride would require 1·829 gr. of pure chlorate of potash to be entirely changed into perchloride. This useful test may be performed in a few minutes with the small apparatus above described.



inclined the neck of the flask so as to avoid any loss by projection. The solution of the iron being thus effected, the 3·980 grs. of manganese, which should be enveloped in paper, as will be explained further on, are added, upon which the apparatus is gently shaken in a circular direction, and then closed with the cork having the funnel-tube. It is then heated to boiling for some minutes, being shaken the whole time, removed from the fire, and a moist slip of litmus paper, or what is better, paper coloured by indigo, suspended in the upper portion of the flask, which is easily done by fixing one extremity of the slip between the neck of the flask and the cork\*.

The iron at present is only partially converted into the perchloride, as the commercial manganese is never pure, which it must have been in order to have liberated from the hydrochloric acid the chlorine requisite for the exact perchlorization of the whole of the protochloride of iron present. Now it is precisely in order to determine how much remains of this salt to be changed into the perchloride, that the known solution of chlorate of potash above mentioned is employed; it is poured from a weighed vessel, which is filled with it by means of the funnel-tube into the flask, until the decolorization of the paper indicates that chlorine begins to predominate, when we may be certain that the whole of the protochloride of iron is converted into the perchloride†.

This done, it is now only necessary to note down the weight of the solution of chlorate employed to produce this result; and since 100 grs. of this liquor give, when heated with hydrochloric acid in excess, 3·170 grs. chlorine = 100 chlorometric degrees, it suffices to subtract from 100, the number of grammes less 0·5 gr. of the solution of the chlorate employed, to ascertain at the moment, and without any further calculation, the value of the manganese submitted to the test. The thing is so simple, that it would be idle to quote examples; but believing that it may not be useless to enter into minute details in describing a process, I will add, that to carry out the test quickly, and to avoid any loss of manganese, it is advantageous to convey this oxide from the plate of the balance into a long-necked, cylindrical, somewhat broad funnel, on which has been previously rolled a small square piece of strong paper, the lower margins of which have been folded together; the opposite portion is closed in the same way after the introduction of the manganese; so that in this manner a kind of little cartouche, containing the exact dose of manganese, is easily and quickly obtained. It is easy to introduce this, without any fear of accident, into the proto-

\* The indigo-paper is the most sensitive, and is very easily prepared by immersing perfectly white sized paper in sulphate of indigo, and subsequently washing it, first with water slightly alkaline, and then with pure water, and drying it in the air.

† Experience shows that it is requisite to pour into the flask of 3-decilitre capacity, which contains only pure hydrochloric acid, from 4 to 5 decigrammes of the solution of chlorate of potash, in order to produce the decolorization of the paper. It is necessary therefore to subtract this quantity, or which is the same, to increase the ascertained amount by half a degree.



chloride of iron. To hasten this operation still more, but principally in order to avoid errors in the weighing, it is well to have two counterpoids, one of 4.858 grs. for the iron, and the other of 3.980 for the manganese.

I will remark, in conclusion, that the method just described is applicable in several other cases in which it is required to estimate the quantity of free chlorine.—*Journ. der Pharm.*, March 1842.

### *Manufacture of Soda and Sal-ammoniac.*

Kastner has proposed, for the contemporaneous manufacture of white soda (soda-ash) and sal-ammoniac, to mix intimately common salt and oxalate of ammonia, which might be obtained cheap in manufactories of sulphuric acid\*, in their chemical proportions, and to decompose them by heat in order to obtain those products.—*Arch. der Pharm.*, Feb. 1843.

## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

*March 21st.*—(The President, in the Chair.) “On Theine and its preparation,” by Dr. John Stenhouse.

Dr. Stenhouse recommends the preparation of theine by sublimation in the apparatus consisting of a shallow iron pan, the mouth of which is covered by paper pressed down at the edges, and the whole then covered by a cylindrical cap of paper, which was employed by Dr. Mohr for the sublimation of benzoic acid from gum benzoin. A decoction of the tea is precipitated by acetate of lead, the liquor filtered hot and evaporated to dryness. The dry extract is heated for sublimation.

The following proportions of theine were obtained from different kinds of tea:—

From green hyson . . . . .	1.05 per cent.
... black congo . . . . .	1.02 ...
... black Assam . . . . .	1.37 ...
... twankay (green) . . . . .	0.98 ...

Theine was obtained from coffee by the same process slightly altered. Dr. Stenhouse agrees with Prof. Liebig in ascribing the active properties of tea to this principle.

The decoction of Paraguay tea was precipitated first by acetate of lead, and then the filtered liquor by subacetate of lead; and the liquid drawn off and evaporated to dryness. When the extract was submitted to distillation, it gave long flat crystals exactly resembling theine. The sublimate also resembled theine in its odour and relations to water, alcohol and æther. It also answered to a new test of theine, which Dr. Stenhouse describes.

Theine is boiled for a few minutes with twice its weight of fuming

\* We very much doubt whether this salt could be obtained sufficiently cheap in England to carry this process into execution.—Ed.



nitric acid, by which a bright yellow solution is obtained. This liquid, gently evaporated to dryness, leaves a deep yellow mass. A drop of ammonia is let fall upon this, and a gentle heat applied, when a splendid purple colour is immediately produced, similar to that from uric acid.

The carbon and hydrogen in the theine of Paraguay tea were also determined:—

	Found.	Calculated.
Carbon . . . . .	49.96	49.79
Hydrogen . . . . .	5.145	5.08

From want of material the nitrogen was not determined. Dr. Stenhouse has therefore no doubt that Paraguay tea contains theine, although the proportion is small.

The leaves of the *Camellia Japonica* and of the Holly were examined for theine, and found to contain none.

The action of nitric acid upon theine was further examined, and found to yield two new crystalline substances, which are described, but not named nor analysed.

The solution of theine in hydrochloric acid is also found, when mixed with a solution of bichloride of platinum, to give a double chloride in small orange crystals. The platinum in this salt corresponds with theory. This double salt appears much more stable than the simple hydrochlorate of theine.

“Observations on M. Reiset’s Remarks on the new Method of MM. Will and Varrentrapp, for the Estimation of Nitrogen in Organic Compounds,” by Dr. Will.

After alluding to M. Reiset’s essay, which was read before the French Academy, the author proceeds to combat in detail the two leading objections raised in that paper to this process; and proves, by a series of experiments conducted with the greatest possible attention to accuracy, that the objections of M. Reiset are without foundation, and that the results obtained by that chemist must have arisen from foreign admixture in the materials operated upon. The author then proceeds to examine the curious phenomenon observed by Faraday, that non-nitrogenous bodies give off ammonia when heated with hydrate of potash; that this ammonia is not formed during the process, but existed previously in the materials employed, or imbibed it from exposure to the atmosphere, confirming Braconnot’s observation, that many porous minerals yield ammonia by distillation in a glass retort. Dr. Will demonstrates by experiment that ammonia cannot be formed by the union of the nitrogen of the atmosphere with hydrogen gas at the moment of its separation from any compound, thus fully confirming the correctness of Faraday’s observations. The general statement, that iron, by its oxidation under the combined influence of moisture, air and heat, affords the nitrogen of the atmosphere the conditions necessary to form ammonia, is then carefully investigated, and proved without doubt to arise from ammonia absorbed as such from the atmosphere during the process. The whole communication abounds in details of most careful experiments to prove the various questions at issue.



## PATENTS.

*Patent granted to Richard Beard, Earl-street, London, for Improvements in the Means of obtaining Likenesses and Representations of Nature, and of other Objects.*

THE invention relates to modes of colouring the pictures produced by what is now well known as the Daguerreotype process, whereby likenesses and representations of nature and other objects will be obtained in a more finished condition than can be effected by the simple process of Daguerre. This method consists in the deposition of various colours in the state of impalpable powders on different parts of the picture in succession, the outline and extent of each colour being regulated by a pattern or screen somewhat resembling a stencil-plate.

In the first place, the picture being produced, is placed upon a shallow rectangular frame a little larger than itself, this frame being provided with a rebate or projecting edge or border, standing about one-twentieth of an inch above the surface of the plate; upon this rebate a thin sheet of glass or mica is placed, so as completely to cover the picture; then with a camel-hair pencil and a little colouring material a tracing is made upon the glass or mica, corresponding to the part of the picture it is intended to colour; a light rectangular frame having been covered with tracing paper, and previously fitted so as to rest accurately upon the original frame, one of these is placed upon the glass, and the original tracing copied upon the tracing paper; the paper between the lines so traced is then cut out with any convenient instrument.

By this means, when the glass which previously covered the picture is removed, it will be found on applying the tracing paper screen that all parts of the picture are covered, with the exception of that part cut out between the lines of the tracing, which being exposed is ready to receive the colour. A number of patterns, for the different parts of the picture, are then to be made in the same manner as the first, and the separate screens so produced (each having a part or parts cut out) are to be used in succession over the picture, and colour will be deposited, as hereafter explained, on to the picture, each screen allowing those parts of the picture to be coloured at those parts where the screen is cut away.

The dry colours (such as are usually employed in the arts) are carefully ground in a weak solution of gum-arabic, starch, isinglass, or any convenient adhesive material; if gum be employed, 30 grs. to a quart of water is what is found to answer best.

The colours, after being ground to an impalpable powder, are dried in a stove, at a temperature below  $212^{\circ}$  Fahr. They are then sifted through very fine sieves, carefully preserved from the slightest moisture.

Having provided several wooden boxes, a little larger in the base than the frame to which the picture was attached, and about three inches high, a few grains (say 50) of the different prepared colours



are put into each ; and a fine dust being raised in the interior of the box about to be used, by beating it in the inside with a large soft brush, the picture, covered with the screen, and consequently only partially exposed, is then introduced, and the colour gradually allowed to settle upon it. After a short time it is withdrawn, and the colour removed from the shadows by being blown off with a pair of small bellows. By gently breathing upon the plate, the colour just applied attaches itself with such firmness to the metal, that it is not liable to be removed by applying the bellows afterward when making use of other colours. It is for this reason that the colours are ground with gum or some similar substance, so that the particles may agglutinate on coming in contact with moisture.

By the above it will be seen that the colours are used singly, and in succession, over the different parts of the picture, the form and extent of their deposit being of course regulated by the pattern traced from the picture.

Another mode of colouring such pictures is by using transparent water with gum, and in place of actually putting such colour on to the picture, the surface of the glass which comes next the picture is to be coloured or tinted lightly by the artist, and he is enabled to accomplish this correctly by having first taken a tracing on the outer surface of the glass, as before described, and applying the different colours on the under surface of the glass to the different parts of the traced picture, the colour in this case being laid on in a wet state by a brush. By this means it will be evident that when the glass is fixed in front of the picture, and as close up to the picture as possible, the different parts of the picture will be seen through the coloured parts of the glass, and offer the appearance of a coloured picture.

Another mode of colouring such pictures is by using the colours on the parts of the picture, and applying them by hand ; this is accomplished by means of a camel-hair pencil with dry colour, prepared as above described ; and the artist applies the different colours by dotting them on to the different parts, producing a sort of stippled surface, the colours being successively set by breathing over them.—Sealed March 10, 1842.

*Patent granted to Dominic Frick Albert, Cadishead, near Manchester, for a new Combination of Materials, for the purpose of manufacturing a Manuring Powder.*

This invention consists in a cheap method or methods of introducing into compost or manure such acids, alkalies and salts as are required for the nutrition of plants.

A composition or mixture is first produced, consisting of four classes of ingredients :—viz. 1st class. Seven parts of ammoniacal water, from the gas-works, or four of the spent urinal liquor, resulting from the scouring of woollen tissues, cloth, flannel, &c. 2nd class. Six parts of human excrements, which should be passed through a riddle, to free them from all extraneous matters. 3rd class. Six



parts of blood, animal gelatine, fibres or teguments; all flesh and skin being previously boiled to a pulp, to save grinding and chopping. 4th class. Two parts of horse- or cow-dung. These ingredients are worked into a paste in a large vat or cemented reservoir, and their volatile ammoniacal gases are combined in the mixture by the addition of from 2 to 3 per cent. of hydrochloric acid.

The composition is now mixed with a powder, composed of five classes of substances, which are as follow:—1st class. Four parts of ground charcoal. 2nd class. Two parts of either chromate of lime, sulphate of lime, muriate of lime, or sulphated clay. 3rd class. One part of ground schist, or pulverized and well-dried aluminous clay. 4th class. One part of vegetable ashes, or alkaline silicates, such as the refuse of glass-works. 5th class. One part of common salt. This manure will dry into a powder if placed under a well-aired shed, or the drying may be hastened by means of a stove; but it will have a much quicker effect on the vegetation when used in a damp state. It may be spread over the land with a hand-spade, in the same manner as bone-dust, &c.

As some of the ingredients above mentioned may not be readily obtained in various places, the patentee has mentioned a number of matters which may be substituted for them. The following are the materials that may be substituted for those which were employed in the preparation of the composition:—1st class. Urine in general, from man and beast, in the proportion of two parts of the former to three of the latter; or two parts of bone-dust, macerated in half its weight of sulphuric acid, may be used instead of five parts of urine. 2nd, 3rd and 4th classes. All sorts of animal refuse, such as tallow-chandlers' grease bottoms, woollen rags, tanners' spent lime containing much hair, scrapings and cuttings from hides and leather, offal from the dressing of sheep's feet, animal charcoal from prussiate of potash works, cotton spinners' waste impregnated with oil, the refuse from glue manufactories and from cleaning foreign wool, &c. Instead of hydrochloric acid sulphuric may be used, to prevent the exhalation of any unpleasant smell from the composition.

With respect to the powder, those ingredients which may be substituted are as follow:—1st class. Equal quantities of soot and charcoal. 2nd class. The refuse of those soaperies, where kelp is employed, can advantageously represent one-half of the earths before mentioned; pulverized oyster-shells also belong to this class. 3rd class. The schist may be reduced to powder by exposure to the rain in place of grinding it. 4th class. The soap-suds, or soapy water, produced in any of the different branches of manufactures, are received into a cistern, and the mineral powders, before alluded to, are added to them; the water evaporates, leaving the grease and caustic alkali combined with the other materials. 5th class. The worst kind of rock-salt, or all kinds of sea plants, dried and rubbed into a powder, or calcined, or the animalized spent salt, from the curing of pork, &c.—Sealed August 10, 1842.



# THE CHEMICAL GAZETTE.

No. XIII.—May 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On Ferric Acid.* By M. WACKENRODER.

THE modification of Fremy's method of preparing this acid, recently recommended by Trommsdorff, consists in heating in a Hessian crucible an intimate mixture of iron filings and nitre. From experiments recently performed under M. Wackenroder's care, it was found somewhat difficult to hit the right degree of temperature. If the crucible is too hot the nitre melts, and then no deflagration is effected however strongly the mass be heated; and in such case nothing else remains to be done than to pour the mass out into an iron mortar, and then to return it into the crucible, which has again been heated.

The preparation succeeds best, when a large crucible, capable of holding from 1 to  $1\frac{1}{2}$  lb. of water, is heated so strongly that the bottom and a couple of inches above it appear faintly but distinctly red. In this manner the crucible just acquires the temperature requisite for the deflagration. An intimate mixture of 12 grms. of *dried* nitre and 6 grms. of the finest iron powder is thrown at once into the middle of the crucible, or what is better, a little on one side, that the nitre may not melt. Often some seconds elapse before the reaction commences, but as soon as it does the mass swells, becomes incandescent, and deflagrates in a lively manner but without danger, resembling a mixture of the sulphuret of antimony and nitre. During the deflagration, or immediately afterwards, the crucible is removed from the fire, the somewhat soft ragged mass taken out with an iron spoon, and pounded in a mortar. The coarse greenish-gray powder must be immediately brought into a well-stoppered bottle, as it very soon becomes moist in the atmosphere and is decomposed. On treatment with water, a portion dissolves to a dark cherry-red solution, which on further dilution acquires an amethyst colour; but after a few seconds the ferric acid is decomposed, a reddish-yellow oxide of iron (perhaps a superoxide) separates, and the liquid becomes colourless. This decolorization appears solely to be caused by the nitrous acid which is contained in the strongly alkaline liquid. Fremy has stated that combinations of ferric acid with bases might also be obtained in the moist way; and Döbereiner has observed that he has succeeded in producing ferric acid by means of chlorine, which he allowed to act on a solu-



tion of potash in which hydrate of the peroxide of iron was suspended. Wackenroder has found that when about 5 grs. of freshly precipitated and well-edulcorated hydrate of the peroxide which had been pressed between bibulous paper is suspended in a solution of 10 grms. of hydrate of potash in 16 grms. water, and chlorine is then rapidly passed into it, the peroxide of iron dissolves entirely in a few minutes, and the liquid becomes warm. When the solution of potash is more diluted, or the quantity of peroxide greater, the liquid remains colourless.

The solution of the ferrate of potash has a dark red colour, and is opaque in a great volume. Some chlorate of potash soon separates from it, on which account it is well to dilute it with an equal volume of water; it then keeps unchanged even on exposure to the atmosphere, and is better adapted for chemical experiments than the solution of the ignited mass, from which it differs solely in its supporting much dilution without being decomposed. The solution remains several days of a beautiful amethyst-red, quite similar to that of the permanganate of potash.

Both solutions are immediately coloured dark green by sulphuretted hydrogen and sulphuret of ammonium, from the formation of a sulphuret of iron, the composition of which probably corresponds to that of ferric acid. They are instantaneously decolorized by acids, salts of the per- or protoxide being formed. All metallic salts, and also alum, likewise decolorize the solutions immediately, peroxide of iron being precipitated with the bases of the metallic salts. When a quantity of perchloride of iron or sulphate of copper is added to the chloriferous solution sufficient for its complete decomposition, the clarified liquid still remains for several days of a peach-blossom colour. Chloride of calcium and sulphate of magnesia afford rose-red precipitates, which however almost instantaneously decompose. The ferric acid does not seem capable of affording stable compounds with lime and magnesia, at least not in the presence of the chlorates or nitrites of potash. Chloride of barium, on the contrary, produces a permanent cochineal-red precipitate in both solutions. Sal-ammoniac, carbonate of ammonia, and ferrocyanide of potassium, decolorize the red solutions immediately, caustic ammonia and alcohol after some time. The solution of the ferrate of potash, prepared by ignition, is likewise decomposed slowly by carbonate of soda and chloride of sodium, which is not the case with the chloriferous liquid. The behaviour of these two reagents is not at all surprising, as the same effect is produced on diluting the two solutions with pure water; the colour however of the latter liquid is changed by chloride of sodium into a red, by carbonate of soda more into a blue; an addition of the latter salt increases the constancy of the ferric acid. The solution of the alkaline ferrates with an excess of alkali, may be filtered through paper without the ferric acid being rendered more liable to decomposition.

The ferrate of barytes seems to undergo no change fromedulcoration and drying in the air, but it generally contains carbonic acid, the presence of which however it would not be very difficult to



avoid, or it might be taken into account in an analysis of the salt. The dried salt of barytes has hitherto been obtained only of a brick- or rose-red colour; heated in a glass tube it is rendered colourless; it dissolves immediately and without colour in nitric acid, giving off carbonic acid, which without doubt is mixed with oxygen. It is remarkable that the salt is not immediately decomposed by dilute sulphuric acid (at least not in the cold), but remains of a pale red colour.

Hydrate of the oxide of copper, exposed to a similar treatment, appeared to remain unchanged; after a time, a greenish liquid, containing copper, was formed, and a bluish-green sediment.

Hydrate of the oxide of nickel was only converted into peroxide; the liquid remained colourless.

When hydrate of the oxide of manganese, or pulverized proto-carbonate of manganese, is suspended in a strong solution of potash of 1 part caustic potash and 4 parts water, and chlorine gas is then passed into the liquid, a beautiful red solution of permanganate of potash is obtained. But the permanganic acid is not so easily formed, and always more slowly under these circumstances than the ferric acid. The protocarbonate of manganese appears to be better adapted than the hydrate of the peroxide for this purpose. When the solution of the potash is more concentrated the liquid acquires less easily a red colouring. Even very dilute solutions become gradually red when an excess of potash is present.—*Ann. der Pharm.*, xxxiii. p. 41-46.

#### *On Menyanthine.* By M. BRANDES.

The difficulties which are encountered in the preparation of menyanthine depend chiefly on the presence of colouring matter, sugar, and some organic salts which are soluble in alcohol; at the same time the menyanthine appears to undergo some change very easily by the long application of heat. The following method will be found to be a great improvement:—An extract of the herb is prepared with alcohol of from 0.889 to 0.876 spec. grav., either by displacement, maceration, or with the expressed juice, the alcohol is distilled off, the aqueous residue filtered, a little yeast added to it to remove the sugar, and when fermentation has ceased 2 oz. of the hydrate of the oxide of lead mixed in water added to it for every pound of herb. The lead becomes yellow, and the liquid now appears only slightly yellow with a greenish tint; it is filtered, the excess of lead removed, again filtered, and evaporated at a moderate heat to the consistence of an extract (at 140° Fahr. it already begins to acquire a brown colour). Alcohol of 0.815 spec. grav. is added to the extract, and is left to stand with it for some days; the brownish-yellow solution is then separated, shaken with animal charcoal, filtered, and the alcohol removed by evaporation over sulphuric acid as it becomes brown by distillation. The yellow syrupy mass obtained dissolves in a little water to a clear solution; but on the addition of more water it becomes milky, and some drops of oily



resinous matter separate; these are removed, and evaporation is now continued in vacuum. In this manner a yellowish-white, partially crystalline, and in part amorphous, granular mass is obtained.

This menyanthine has a pure bitter taste; it very quickly becomes brown by heat with absorption of oxygen, decomposes when ignited like all bitter substances, leaving behind some lime; it dissolves easily in alcohol, in water containing æther and alcohol, but not in pure æther. The aqueous solution is not rendered opaque by the fixed alkalies on account of the lime salts; it is not changed by ammonia, chloride of barium or acetate of lead, but a slight milkiness is produced by protochloride of tin and tincture of galls, a slightly yellow precipitate by chloride of platinum, and a whitish one by nitrate of silver, a white by salts of mercury and sulphate of copper, and a yellowish-white by protosulphate of iron. The last precipitate behaves as sulphate lime; menyanthine does not therefore combine with the metallic oxides.

The best method of preparing the *Extractum trifolii* would therefore be by forming an alcoholic extract by displacement, and subsequent extraction of the first product with strong alcohol. A menyanthine fit for use might be obtained by treating the spirituous extract with hydrate of the oxide of lead, removing the lead, filtration, evaporation, extracting the residue with alcohol, and then evaporating at a gentle heat.—*Archiv der Pharm.*

*Chemical Examination of a Saccharine Matter collected on the Leaves of the Lime. By M. LANGLOIS.*

During the great dryness which prevailed last year in the months of March and June, the upper surface of the leaves of the lime was covered with a thick and sweet liquid, which was so abundant that it fell at certain hours of the day in the form of rain. A lime-tree of an average size might easily have furnished several pounds. This saccharine production was observed by M. Fée, who directed my attention to it, his engagements not allowing him at that time to take up the subject. A secretion, not less abundant, the nature of which has not been determined, has been observed on other trees, especially on the walnut. The saccharine principle of the leaves of the lime dissolved entirely in water, the solution filtered and evaporated in a water-bath, afforded a slightly coloured syrup. During evaporation a small quantity of vegetable albumen coagulated. The syrup, slightly diluted with water, reddened litmus paper faintly, and afforded an abundant precipitate with subacetate of lead; the silicate of potash forms, after some hours, a gelatinous precipitate in it; it is also thrown down by barytes-water and chloride of barium; the precipitate is partly soluble in hydrochloric acid. Persulphate of iron imparts to it a brown tint; nitrate of silver, oxalic acid, oxalate of ammonia, produce slight precipitates; it is coloured of a deep brown by concentrated sulphuric acid, and somewhat less intense by hydrochloric acid.

It was found by experiment to contain grape-sugar, non-crystal-



lizable sugar, mannite, mucilage, vegetable albumen, a little tannin, and salts of inorganic bases, acetates of potash, of lime, sulphate of lime, chloride of potassium and of calcium. Its acid reaction appears to be owing to malic acid, and perhaps also to lactic acid, which is produced under certain circumstances at the same time with the mannite.

This saccharine liquid has been frequently observed on the leaves of the lime-tree, but its abundance this year was without doubt owing to the absence of rain; it probably owes its existence to the sap in which analysis has shown the presence of cane-sugar. This sap, elaborated and accumulated on the surface of the leaves, undergoes in its chemical constitution modifications which must be attributed to the action of the air assisted by a high temperature; thence the possible transformation of cane-sugar into mannite, grape-sugar and non-crystallizable sugar; a portion however of these two kinds of sugar may have originated during the concentration of the syrup. Mannite has been detected in several plants, but it has not been found in the sap of the lime, which would lead to the belief that in this case its production was accidental.—*Ann. de Chim. et de Phys.*, March 1843.

*Two Cases of Poisoning from the Application of a Cerate containing Arsenic, prepared from newly-made Wax Candles. By Dr. ERRARD.*

A man, 53 years of age, who was suffering from pneumonia, but was convalescent, had two blisters applied, one on each arm. The wounds were both dressed with ointment. Next day Dr. Errard was sent for early in the morning, and on his arrival he found the patient in the following state:—The arms were painful; the tongue was red, dry and cracked; he had urgent thirst, with a quick, small and irregular pulse; pains in the abdomen, but no purging; and involuntary contractions of the muscles of the inferior extremities; there was also headache. The patient died in the evening. Dr. Errard suspected poisoning; but on the relations denying that he had taken anything hurtful, the investigation was not pushed further.

The second case happened eight days after the one just related. A blister was applied on the thigh of a young woman who complained of headache from suppressed catamenia; it was afterwards dressed with ointment, which caused such pain that the dressing was removed. Upon Dr. Errard's visiting her, he found her complaining of great thirst, with nausea and pain in the epigastrium. The tongue was red, the wound was inflamed, and there were twitches in the limbs. In a few days she was quite well.

In a child the application of an ointment to a sore on the nose increased rather than improved the ulcer.

On inquiry it was found that in all the cases the ointment was got from the same shop, and that it was made from wax candles containing arsenic. No chemical examination of it however took



place ; but the cases, Dr. Errard says, may be of use in informing the public of the composition of these candles, as in almost all the villages a cerate is made from the remains of the lights employed in the churches ; lately the candles have been hardened by arsenious acid.—Abridged from *Gaz. Méd. de Paris*, Nov. 5, 1842, and *Lond. and Edinb. Monthly Journal of Medical Science*, April 1843.

*Double Salts of the Perchloride of Tin with the Alkaline Chlorides.*

M. Bolley has examined the double salts which the perchloride of tin forms with the chlorides of potassium, sodium and ammonium. The perchloride of tin was obtained by passing a current of chlorine to saturation into the protochloride, and then expelling the excess of chlorine by means of heat.

The *potash salt* was obtained by dissolving chloride of potassium in a solution of perchloride of tin, taking care however that the solution should contain an excess of the latter ; it was then evaporated to crystallization. The double salt is deposited in anhydrous octahedrons, which are composed of  $KCl + SnCl_2$ .

The *soda salt* is prepared in the same manner, but it is so soluble that it is difficult to separate it from the excess of the perchloride of tin. It crystallizes in hemitropal prisms which contain water, one portion of which is expelled by heat. It contains less of the perchloride than the potash salt, *i.e.* 2 atoms of chloride of sodium to 1 of the perchloride of tin. M. Bolley does not however consider the analysis satisfactory.

The *ammonia salt* has long been known by the name of *pink salt*, from its application in dyeing of this colour. It is prepared in the same manner as the above with perchloride of tin and sal-ammoniac. It crystallizes in regular octahedrons, which are isomorphous with the potash salt. Like this latter it is anhydrous, and is composed of  $NH_4Cl + SnCl_2$ . M. Bolley draws attention to the analogy which all these salts present in composition and in form to the corresponding double salts of platinum, which indeed is very remarkable. The ammonia salt dissolves in 3 parts water at  $58^\circ$ . This solution may be boiled without any change taking place ; but if diluted with more water and then boiled, it deposits stannic hydrate.

M. Bolley moreover observes, that the chloride prepared in this manner is a far more advantageous mordant than that obtained by combining oxide of tin produced by nitric acid with hydrochloric acid.—Berzelius' *Jahresbericht*.

*On the soluble Constituent of Rye-Flour.* By M. HELDT.

When rye-flour is treated with alcohol a brownish-yellow liquid is obtained, which on cooling becomes very opaque, and may be separated from the insoluble residue by filtration and pressure. On distilling off the alcohol a yellowish-brown viscid mass remains, which has the smell of bread, and which on the removal of the fat with æther becomes yellowish-white. If it is then washed with water



and dried between blotting-paper it becomes brown, smells of bread, may be kneaded between the fingers, and only after long drying becomes horny. It affords on dry distillation ammonia, has a slightly acid action; it is not at all soluble in cold and very little in hot water (it is rendered slightly opake by solution of sugar of lead and corrosive sublimate); it dissolves easily in boiling alcohol (the solution is precipitated by water, tannic acid, sugar of lead and corrosive sublimate); it also dissolves in warm solution of caustic potash, with evolution of ammonia and formation of some sulphuret of potassium; and in warm ammonia. The alkaline solutions are thrown down white by acetic acid; concentrated hydrochloric acid gives a purple-red solution, which becomes opake on cooling. Nitric acid produces with evolution of nitric oxide a yellow liquid, which smells of melted butter, is coloured reddish-brown by an excess of caustic potash, and with less potash affords a paler brown saponaceous precipitate.

Acetic acids, and other dilute acids, afford in excess, and at a boiling heat, solutions from which on cooling the greater portion again separates in flakes, and which are precipitated by water, alkalies, and the ferro-prussiate of potash. This substance has the composition of the proteine compounds, for it contains in 100 parts,—

Carbon .....	56.38	56.15
Hydrogen .....	7.87	8.06
Nitrogen .....	15.83	15.83
Sulphur and oxygen .....	19.92	19.96

*Ann. der Chem. und Pharm.*, xlv. p. 198–200.

### *Aconite in Rheumatism.*

Dr. Busse of Berlin has published a monograph on the use of aconite, in which he recommends it in acute as well as chronic rheumatism. If there be a foul condition or inflammation of the primæ viæ, that must be removed by appropriate treatment previous to its administration. He has never seen it cause any excitement of the vascular system, as camphor does. The diaphoresis which it induces is neither preceded nor accompanied by any disorder of the system, and the removal of the rheumatic pains is obtained sometimes without any increase in the renal or cutaneous secretion. The formula employed by Dr. Busse, for the last twenty-five years, is a prescription of Richter, and is as follows:—4 scruples of extract of aconite, dissolved in 30 of tartar-emetic wine. Of this, at first, he gave only small doses, in accordance with Richter's advice, from 15 to 25 drops every 2 hours; but he soon found he could give double the quantity, not only without danger, but with greater prospect of success. In order to prove the harmlessness of very large doses of aconite, he mentions that a patient took, in the course of 10 hours, 2 scruples and 5 grs. of the extract, dissolved according to the preceding formula, without the supervention of any symptom of narcotism or other serious disorder, the only evidence of its action on the system being a great increase of the perspiration,



and, at the same time, a notable diminution of the pain, which had been experienced with exceeding severity in the morning.

Dr. Busse now begins with from 30 to 40 drops at a dose, and rapidly raises it to 60. He has found it of equal service in all cases of pain arising from a rheumatic origin, in toothache, cramps of the stomach, &c.—Hufeland's *Journal*, in *Prov. Med. Jour.*

*On the Products from the Action of Chlorine on Sulphuret of Carbon.* By H. KOLBE.

A current of dried chlorine was conveyed through a vessel containing sulphuret of carbon, and the mixture of the two gases then passed through a porcelain tube filled with pieces of porcelain and heated to redness. In the receiver, which was kept well-cooled, a reddish-yellow liquid collected, without the formation of any other product or the separation of carbon. This liquid, of which a larger quantity was obtained than the sulphuret of carbon employed, had the smell of chloride of sulphur, and was found to be a mixture of this latter compound and Regnault's perchloride of carbon. It is decomposed by water into sulphur, sulphurous acid, hydrochloric acid, and perchloride of carbon, which sinks to the bottom. The latter is best isolated by carefully adding to the mixture caustic potash or lime-milk in excess, long standing, frequent shaking, and subsequent distillation, when the perchloride of carbon passes over pure, and may easily be prepared in this manner. It is not necessary to warm the sulphuret of carbon, but the chlorine must be perfectly dry, otherwise the combination of chlorocarbonic oxide with chloro-hyposulphurous acid is formed. Boiling point, specific gravity, and composition of the perchloride of carbon, were found to be identical with the results obtained by Regnault.

When some grammes of sulphuret of carbon are conveyed into a flask filled with dried chlorine, and left to stand for some weeks well-closed, the chlorine disappears, and a dark yellow liquid is formed, which contains chloride of sulphur, and a new compound that may be considered as a chlorocarbonic oxide, the oxygen of which is replaced by sulphur. The chloride of sulphur is decomposed by treatment with water, and the new body separates, and may be obtained pure by repeated distillation with water and some magnesia. In order to prepare the new compound, it is best to allow sulphuret of carbon to remain for a long time in a closed vessel containing a mixture for liberating chlorine; it is frequently shaken, and subsequently distilled. The new body is also formed at the same time with hydrochloric acid, when a mixture of sulphuretted hydrogen and perchloride of carbon is conveyed through a glass tube heated to dull redness.

The new body is a yellow, oily, acrid-smelling liquid of 1.46 spec. grav., which does not mix with water; it boils at about  $158^{\circ}$ , is neither altered by water nor by acids (not even by fuming nitric acid), but is decomposed by caustic potash with the formation of carbonate of potash, sulphuret of potassium, and the separation of



perchloride of carbon. In the analysis of the substance, which was purified as much as possible by treatment with water and desiccation over chloride of calcium, the sulphur was determined by digesting the liquid several days in closed vessels with caustic potash; then driving off the perchloride of carbon, oxidizing the solution of sulphuret of potassium with chlorine, and then precipitating the sulphuric acid. In the calculation of the analysis, the body has been supposed to be contaminated with sulphuret of carbon; but whether this actually amounts to 7 per cent., as is admitted by the author, must be decided by future experiments.

	Found.	Atoms.	Calculated.
Carbon . . . . .	10.72	1	9.72
Chlorine . . . . .	56.76	2	56.76
Sulphur . . . . .	32.16	1	25.79
	<u>99.64</u>		<u>100.00</u>

From the mode of formation and decomposition of this body, it seems more reasonable to regard it as a combination of perchloride of carbon with sulphuret of carbon =  $C C^4 + C S^2$ , so that therefore the chlorine decomposes the sulphuret of carbon in precisely the same manner at a red heat as in the cold, with the exception that in the latter case the perchloride of carbon combines chemically with a portion of the sulphuret of carbon which has remained undecomposed.—*Ann. der Chem. und Pharm.* for Feb. 1843.

## ANALYTICAL CHEMISTRY.

*On the Precipitation of many Acid Solutions of Salts by Acids.*

*By M. WACKENRODER.*

IT is a well-known fact that many salts are thrown down by an excess of the same acid as is contained in them; such, for instance, is the case with nitrate of barytes, which is precipitated from a concentrated solution by strong nitric acid. It cannot be doubted that precipitations of this kind result in consequence of the concentrated acid combining with the water, and the precipitate consequently disappears immediately on the addition of a sufficient quantity of water. In such cases, where acid salts are formed by the addition of acid, no precipitate can occur; and in all cases where the solubility of the salts is increased by the excess of acid, it is necessary to presuppose the formation of soluble *acid* salts. There must therefore exist a *soluble acid* sulphate of lead, and indeed in the sulphuric acid of commerce, for every one is aware that even the most clear sulphuric acid which has been prepared in the leaden chambers, when diluted with water, frequently deposits a considerable quantity of sulphate of lead. When such an acid is exposed for some considerable length of time to a dry atmosphere, small well-formed crystals of the lead salt are obtained. An important difference however exists between this acid sulphate of lead and other acid salts, the former being so completely decomposed by water that



not a trace of it remains dissolved in the sufficiently diluted sulphuric acid.

Far more important for analytical chemistry is the precipitation of several salts, especially of the sulphates and oxalates, by *excess* of acid when they have been dissolved in other acids, as in nitric or hydrochloric acid. If, for instance, protosulphate of mercury be dissolved in *dilute* nitric acid, the salt may be again separated almost entirely by an addition of *dilute* sulphuric acid. When a solution of sulphate of lead in dilute nitric acid is mixed with dilute hydrochloric or phosphoric acid no turbidness results, but if in their stead tartaric acid be added in sufficient quantity a precipitate is immediately formed; the separation is however most completely effected by sulphuric acid. Quite an analogous case occurs in the precipitation of several metallic oxides from their ammoniacal solution by caustic potash without the application of heat. Not only oxide of nickel, but even the oxides of cobalt, cadmium and copper are separated from their combination with ammonia by potash, probably from both alkalies, notwithstanding their great chemical similarity, having a greater attraction for each other than the ammonia and the metallic oxide. To this relation (existing between two chemically very similar bodies with regard to a third, in order to precipitate the latter from its solution) the author applies the name of *paralysis*.

Sulphate of lead is dissolved with difficulty by dilute nitric acid, but a *perfect solution* even of a *considerable* quantity may be obtained. When dilute sulphuric acid is again added to this solution, and indeed as much again as was employed of nitric acid, the lead is gradually but entirely reprecipitated as sulphate of lead. The alkaline sulphates do not throw down the lead from such strong acid solutions, or at least very imperfectly. The lead therefore may be most easily separated and most accurately determined quantitatively from the neutral or acid solution of a compound containing lead in nitric or muriatic acid, by adding dilute sulphuric acid in such quantity as that no further opakeness shall result after long standing. In this manner the composition of the *phosphate* and *arseniate* of lead may be determined very accurately, and the quantities of the acids be ascertained quantitatively. Any quantity of the anhydrous lead salt obtained in the analysis by precipitating the acids with acetate of lead, is dissolved with the assistance of heat in dilute nitric acid, and a large quantity of dilute sulphuric acid is then added; so little lead remains in the solution that it may be neglected, or the filtered solution may be saturated with ammonia, and then treated with sulphuretted hydrogen.

When it is not possible to diminish the large quantity of free nitric or muriatic acid by evaporation or neutralization, a small quantity of oxide of lead cannot be converted into sulphuret of lead by sulphuretted hydrogen. When sulphuret of ammonium is added to a dilute solution of lead, sulphuret of lead is formed, which redissolves entirely without much difficulty in moderately concentrated nitric or muriatic acid. Sulphuretted hydrogen may be passed through the solutions for a long time, especially through the solution



in hydrochloric acid, without any effect: but as soon as they are diluted with water, black sulphuret of lead is thrown down, and entirely if sufficient water is added.

Oxalic acid exhibits a similar example of paralysis of other acids. When, for instance, a solution of chloride of strontium, acidulated with a sufficient quantity of muriatic acid, is mixed with oxalic acid, no opacity results; but if a little lime is added, the solution immediately becomes turbid. The muriatic acid is therefore paralysed by oxalic acid with respect to the strontia, but not for the lime. Lime is moreover more completely precipitated by oxalate of potash than by oxalic acid. The oxides of zinc, lead and copper may be detected by the addition of a sufficient quantity of oxalic acid from the precipitates, which result in dilute *acid* solutions of oxide of cadmium, protoxide of manganese, barytes, &c.—*Ann. der Chem. und Pharm.*, xli. p. 318.

### *Analysis of Gunpowder.*

Bolley proposes a new method for the analysis of gunpowder, of the advantage of which he has assured himself. It is founded on the property of sulphur to dissolve in sulphurous acid in order to form sulphites. Sulphite of soda is first prepared by passing sulphurous acid into a solution of carbonate of soda, until the whole of the carbonic acid has been expelled. After the dried and weighed gunpowder has been extracted with water, the residue is dried and weighed, and is then brought into a solution of sulphite of soda (20·24 parts sulphite of soda and 1 part of the mixture of charcoal and sulphur), and is boiled for one or two hours in a flask, the evaporated water being replaced. It is then filtered, the charcoal well-washed and weighed; the loss indicates the amount of sulphur. Heating a portion of the carbonaceous residue on platinum foil will show whether the whole of the sulphur has been removed.—*Journ. für Prakt. Chem.*, Dec. 1842.

### *On a Method of detecting Traces of Sulphurous Acid in Hydrochloric Acid. By M. LEMBERT.*

Among the impurities which render hydrochloric acid unfit for testing or in analysis, sulphurous acid occupies the first rank. It is useless to dwell on the importance of detecting its presence. The method which I employ for this purpose discovers the smallest traces. It will in fact detect it where protochloride of tin is of no use\*.

I saturate a little of the acid under examination with carbonate of potash†, then add a small quantity of a weak solution of starch and 1 or 2 drops of iodate of potash or of soda, after which some

\* See also a method of detecting this acid at p. 264 of this Journal.—ED.

† It must not be saturated with the carbonate of soda of commerce, for when pure hydrochloric acid is saturated with it the solution treated in the manner above described will acquire a blue colour on the addition of sulphuric acid.



sulphuric acid, which sets free the sulphurous and the iodic acids, which act on each other; the iodine is liberated and colours the liquid blue.

Care must be taken to add the sulphuric acid in very small quantities, and before adding a new drop to wait to see whether the preceding one has not coloured the solution.—*Journ. der Pharm.* for March 1843.

*Observations on the employment of the Ferrocyanide of Potassium as a Test.* By M. A. LEVOL.

The protocyanide of iron and of potassium, so frequently employed as a test from its combining a high degree of sensitiveness with the advantage of producing with most of the metallic salts precipitates of different colours, has nevertheless one great inconvenience, which is due to its instability in presence of acid liquids; it is well known that it then forms, being rapidly decomposed under this influence, a precipitate of prussian blue, which leads to the supposition of the existence of iron in liquids which do not contain a trace, or at least disguises the tint of the precipitate the manifestation of which is expected. To avoid this troublesome circumstance, it is in general difficult to have recourse to a previous neutralization of the liquid to be tested, as the acid reaction is inherent to most of the metallic salts, and cannot be destroyed without their decomposition resulting; and in such case it is usual to add so much water that the alteration of the double cyanide cannot take place, at least not instantaneously; there remains in fact no other means when searching the presence of certain metals by this test; but for those metals, the salts of which form with ammonia double compounds soluble in water, such as copper, nickel, cobalt, &c., it is far preferable to treat the more or less acid solutions in which they are suspected with a solution of ferrocyanide of potassium to which ammonia has been added, and then to saturate the alkali with a weak acid. The ferrocyanide of the metals in question being soluble in the ammonia, no effect is observed in general on the addition of the mixed test; but as it becomes neutralized, the precipitate appears, and indeed, which is very important, in a flocculent form, so that the smallest traces, which would otherwise have been imperceptible, become apparent.

From some comparative experiments made with the ferrocyanide alone, and others with the same salt to which ammonia had been added, it results that to produce an *immediate effect* with the ferrocyanide of potassium alone, the solution must contain at least  $\frac{1}{100000}$  of copper; but by operating in the manner proposed, that is with the additional ammonia,  $\frac{1}{300000}$  became *immediately* manifest, and  $\frac{1}{500000}$  perceptible after 18 hours; for at the end of this time a precipitate, not to be mistaken from its colour, of a brown-crimson was deposited at the bottom of the glass.

To obtain the mixed test in the state which appeared to me best for this purpose, I add 1 volume of ordinary caustic ammonia to 3



volumes of an aqueous solution of ferrocyanide of potassium containing about 11 per cent. of this salt. So much of this mixture is added to the liquid under examination that the excess of ammonia is sensible to the smell; it is then exactly saturated, or even slightly supersaturated with acetic acid added in drops, at the same time agitating the liquid with a glass rod. This test is very quickly made, especially when the liquid really contains the metal sought for, as its ferrocyanide begins to be precipitated as soon as the alkali is nearly saturated.—*Journ. der Pharm.* for March 1843.

## PHARMACOLOGY.

*On the Kaladana.* By Dr. O'SHAUGHNESSY.

OF the many important novelties which the editor of the 'Bengal Dispensatory' has introduced to our knowledge, none perhaps deserves so much attention as the subject of the present notice. The *Pharbitis cærulea*, Wall., *Ipomæa cærulea*, Kön., *Roxb. Fl. Ind.*, i. p. 501. *Kaladana* of the natives, (of the Nat. Ord. *Convolvulaceæ*,) is common all over the tropics, and in India even ascends the mountains to 5000 feet elevation. Its stems and branches are twining, annual, round, hairy, 6 to 12 feet long, as thick as a crow's quill; leaves stalked, broad, cordate, three-lobed, downy, 2 to 4 inches long, acute; peduncles axillary, round, hairy; two to three flowerets; bracts and sepals linear; flowers large, beautiful bright blue; stigma sub-globose, large, glandular, three-lobed; capsule much shorter than the calyx, smooth, three-celled, with two seeds in each cell. The seeds (*kaladana*) are black, angular, weighing on an average half a grain each, in powder of a gray colour, of sweetish, and subsequently rather acrid taste, and heavy smell. On analysis they yield resin, gum, starch, fixed bland oil, fibre and colouring matter. The powdered seeds, in doses of 30 to 40 grs., act as a quick, safe and pleasant cathartic. We have made this seed the subject of numerous experiments. In 100 cases in which it was given under our direction in the Police Hospital of Calcutta, it proved purgative in 94, occasioned vomiting in 5, and griping but in 15, and produced on an average 5 stools within  $2\frac{1}{2}$  hours. The operation generally commenced in an hour, and in these experiments was never delayed beyond four hours.

The alcoholic extract, which consists of resin and oil, is deep brown, ductile, of excellent pillular consistence, and keeps for several months. In 10-grain doses it produces all the effects of jalap with certainty and speed; the taste is scarcely perceptible. Dr. Chapman has used it in several cases at the General Hospital, and reported on it most favourably to the Medical Board. Dr. Leckie of Bhagulpore, Dr. Green of Howrah, Drs. Martin, Stewart and Goodeve have given similar accounts of its efficacy.

The seeds sell at 4 seers (8 lbs.) for the rupee; these will yield from 15 to 20 per 100 of alcoholic extract, and the whole of the



alcohol may be recovered by distillation. We have thus a remedy of unparalleled cheapness, perfectly equal to jalap as a cathartic, superior to it in portability and flavour, and occurring in all parts of India.

*On the Bebeeru Tree of British Guiana.*

At a recent meeting, Dr. Douglass Maclagan brought before the Royal Society of Edinburgh a notice regarding the Bebeeru Tree of British Guiana, of which we present a brief sketch.

The plant bearing the above Indian name, and also called Sipeeri by the Dutch colonists, furnishes the hard and heavy timber known by the name of Greenheart. The object of the present paper was to state the result of experiments made by the author on the bark and seeds of the tree, which had been found by Mr. Rodie, late surgeon R.N., to contain a vegetable alkali possessed of the power of checking intermittent fevers. Dr. Maclagan stated that the tree was unknown to botanists. Sir William Hooker and Dr. Lindley had seen the fruit and declared it to be lauraceous, but the author had been unable to find in Nees v. Esenbeck's 'Systema Laurinarum' any genus or even suborder of lauraceous plants to which he could refer it. With regard to its chemical qualities, Dr. Maclagan stated that he had obtained both from the bark and seeds two distinct alkalies, both uncrystallizable; to one of which he applied Mr. Rodie's name Bebeerine\*; to the other he gave the name of Sipeerine. They could be separated by anhydrous æther, the bebeerine being soluble in that menstruum, whilst the sipeerine was not. Dr. Maclagan had likewise obtained, especially from the seeds, a peculiar crystallizable and deliquescent acid, which he called bebeeric acid, and which seemed to be distinct from every vegetable acid hitherto described.

The author stated that he had instituted experiments with a view to ascertain if a soluble salt of the alkalies could be procured which might be used as a substitute for sulphate of quinine when dear. He stated as the results of his trials that the produce did not amount to more than one and a half of sulphate per cent. from the bark; but he still calculated that if the bark could be got at a moderate price, the salt of the alkalies might be prepared at a cost inferior to that of sulphate of quinine. Dr. Maclagan stated that the bark appeared to be better suited for the purposes of manufacture than the seeds. The author mentioned that sulphate prepared under his directions had been sent out to Demerara, and had been tried there with marked success in intermittent fever by Dr. Watt. He had likewise used it with success in a few cases of ague in Edinburgh, and also in periodic headache, so that he had no doubt of its possessing considerable power as an antiperiodic remedy. Lastly, he mentioned that a secret preparation, sold under the name of Warburg's Fever Drops, reputed a good antiperiodic, appeared to him to be a tincture of bebeeru seeds.—*Annals of Nat. Hist.* for May.

\* This name is particularly ill-chosen, there being already a *Berberine* from the various of *Berberis*.—*Ed. Chem. Gaz.*



## CHEMICAL PREPARATIONS.

*On the Preparation of Emetic. By E. SOUBEIRAN.*

℞ Finely pulverized and sifted sulphuret of antimony..... 12 parts.  
 Pulverized nitrate of soda ..... 10 ...

or

Nitrate of potash ..... 12 ...

Mix well in a mortar, then convey into a porcelain dish, or, for considerable quantities, into a leaden boiler:

Ordinary water ..... 24 parts.  
 Concentrated sulphuric acid..... 12 ...

Boil, and then add in small portions the mixture of sulphuret of antimony and nitre, waiting previous to each fresh addition until that previously added has acquired a gray colour. When the whole of the mixture has been employed, evaporate at a boiling heat nearly to dryness, then remove the vessel from the fire, and leave the substance to cool.

Reduce the whitish-gray mass thus obtained into a paste with a little water; then mix it with a larger quantity of water and decant, repeating this several times until nothing remains but some heavy particles of the sulphuret which had not been attacked. Wash the fine deposit obtained by decantation, until the water that passes has no longer any acid reaction, and drain with care. Then

℞ Of this moist sulphate of antimony ..... the whole.  
 Cream of tartar in powder ..... 11 parts;

form into a paste with distilled water, which leave for some hours exposed to a gentle heat; then add 96 parts of distilled water, boil for some time, and filter while hot to obtain crystals; the mother-waters will furnish a fresh quantity, and the last mother-waters, saturated with a little potash, will yield more.

M. Mohr, from whose 'Pharmacopœia Universalis' the above process has been taken, prefers it to all others on account of the facility of the preparation and of the goodness of the product. In the preparation of emetic success depends principally on the first preparation of the oxide of antimony; when this has been made in the moist way, it dissolves far more easily in cream of tartar than when it has been exposed to deflagration, calcination, or fusion.

It is also requisite that the oxide of antimony should be as free as possible from iron, as it is very difficult, and takes much time to remove this latter by crystallization, and much substance, time and fire are lost in the operation. Although Algaroth powder dissolves easily in cream of tartar, it is not to be recommended, as its preparation in large quantities is not without difficulties. In the process just described, which does not differ from that given in the London Pharmacopœia of 1809, the iron is removed, and also the arsenic and the acids of the antimony. The substances operated upon are everywhere most easily obtained and in any quantity. The sulphuret which remains mixed with the oxide is also useful, as it prevents by its presence the formation of the acids of antimony.



I have drawn attention to this process, as my own experience has proved to me, as stated by M. Mohr, that it is easy of execution and affords an excellent product. It is, properly speaking, the process of Mr. Phillips, in which an easy method of preparing the sulphate of antimony has been substituted for another process nearly impracticable.—*Journ. der Pharm.*, March 1843.

### *Adulteration of Lactate of Iron.*

In France, instead of this preparation, a mixture of green vitriol, starch and milk-sugar is said to occur in commerce.

### *On Iodide of Arsenic.* By M. WACKENRODER.

M. Wackenroder has made some experiments on the pure solution of iodide of arsenic without mercury, which has been so much recommended against schirrhus. As the mineral arsenic is in general contaminated with other metals, a certain quantity was first sublimed in a curved glass tube over a lamp; 1 grain of the finely pulverized sublimed arsenic and 6 grains of pure iodine were treated in a flask with about 2 drachms of water. The quantity of iodine exceeds in this case by one-sixth the proportion requisite for the formation of  $\text{As I}^3$ ; but this excess is in order to obtain a complete solution of the arsenic, which is effected after about one hour's gentle digestion. The solution, which was coloured brownish by the excess of iodine, was evaporated at a low heat in a small porcelain dish until a crystalline salt of a bright minium-red colour was obtained. The evaporation must be conducted with the greatest caution, in order to avoid volatilizing along with the free iodine some periodide of arsenic in white vapours. As soon as the residue begins to solidify, the temperature should not exceed  $86^\circ$  Fahr., and it is advantageous to allow the last traces of moisture and of the free iodine to evaporate spontaneously at the ordinary temperature, covering the dish loosely with a glass plate. White, brilliant, crystalline scales generally separate from the liquid during the evaporation, but they are no longer perceptible in the dried salt; they are also formed when the imperfectly dried salt is edulcorated on a filter with a little water. They consist, according to Plisson, of arsenious acid, protiodide of arsenic, and of water.

The dried minium-red salt, dissolved in 6 oz. of pure water, forms a transparent colourless liquid, which does not undergo change from contact with the atmosphere. It contains in one drachm  $\frac{1}{48}$  grain metallic arsenic, and  $\frac{5}{48}$ , or nearly  $\frac{1}{10}$  grain of iodine.

This *liquor superiodureti arsenici* has a strong acid reaction. Lime water, or chloride of calcium, with ammonia produce, on account of the diluteness, scarcely any change; but chloride of calcium, with lime water, causes a considerable precipitation of arsenite of lime. Sulphate of copper, together with some potash, does not indicate distinctly the presence of arsenic; sulphuretted hydrogen gas immediately produces a considerable precipitate of



persulphuret of arsenic; but solution of sulphuretted hydrogen only causes a colouring, and a precipitation in the liquid after the addition of a few drops of hydro-chloric acid. Acetate of lead forms a copious yellow precipitate of iodide of lead, and nitrate of silver a yellowish-white one of iodide of silver. Neither pulverized nor boiled starch is coloured blue by the liquid, not even when sulphuric acid is added, but this takes place on the addition of some concentrated nitric acid. The absence of iodine in an uncombined state is already indicated by the solution being free from colour; and since it does not become tinted by exposure to the atmosphere, it may be supposed to contain the iodide of arsenic in its unaltered state. No absorption of oxygen from the atmosphere occurs, for when the liquor which has been exposed to the air is treated with an excess of nitrate of silver, and the precipitate of iodide of silver removed by filtration, the strongly acid liquid affords on the addition of ammonia a pure yellow precipitate of arsenite of silver.—*Arch. der Pharm.* xxxii. p. 80.

*On the Conservation of Mist. Ferri Comp.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

GENTLEMEN,

Each ounce of the *Mist. Ferri P. L.* contains 3 grs. of the carbonate of potash and  $2\frac{1}{2}$  grs. of the sulphate of iron, which will be readily seen by examining the formula of the 'Pharmacopœia Londinensis;' so that instead of its being as your correspondent has it in p. 329, it will be thus:—

To every ℥j. of his

*Solutio pro Mistura Ferri\**

there must be added

Aquæ distillat. ℥ix.

Carb. potas. gr. xxx.

Ferri sulph. gr. xxv.

M.: ft. Oss. *Mist. Ferri P. L.*

Or to every ℥vjss. of his

*Solutio pro Mist. Ferri*

there must be added

Aqua distillat. ℥vij.

Carbon potassæ, gr. xxiv.

Ferri sulph. gr. xx.

M.: ft. ℥viiij. *Mist. Ferri P. L.*

I beg you will take some notice of this communication, as many might be led into a serious mistake (I call it serious to make the least deviation from the Pharmacopœia, because no one knows where it may end), who would not take the trouble to compare all they read with the proper test.

April 17, 1843.

L. P. B.

\* Which *Solutio* I have not the best opinion of. Does every one use the same strength "*Essence of Roses*?" I say no.



*Purification of Mercury.*

The mercury should be heated to about 104° Fahr., then shaken with a concentrated solution of nitrate of mercury, by which the foreign metals are oxidized and dissolved.—*Jahrb. der Prakt. Pharm.*, v. 1842.

*On Lactuarium.*

As there is a decided difference between the lactuarium which has been prepared by extraction and that which has exuded from incisions, Aubergier endeavoured to find out a species of *Lactuca* from which the sap might be obtained in more abundance than from *L. sativa*. In his inquiries he found that there are some species of *Lactuca* whose sap is mild and sweetish (so, for instance, *L. stricta*, *acuminata*, *elongata*), and that most species afford lactuarium, but most abundantly the *L. altissima*. The sap of the *L. altissima* is, when fresh, milk-white, but soon becomes thick and yellow when exposed to the air, and dries rapidly, losing about 71 per cent. water, and not unfrequently being surmounted with a crystalline efflorescence. Alkalies colour the fresh sap of a rose-red; salts of the sesquioxide of iron are thrown down by it of a brown colour, while the supernatant liquid becomes green. It contains mannite, asparamide, an indifferent and a negative resin, wax, pectine, albumine, oxalate of potash, malate of potash, nitrate and sulphate of potash, chloride of potassium, &c., and moreover a crystalline substance, which is coloured rose-red by alkalies and green by the salts of sesquioxide of iron; it is easily converted, in the warmth and under the influence of alkalies, especially when exposed to the atmosphere, into ulmic acid, and occurs in most milky saps. It contains moreover a neutral and probably active principle, which is not soluble in cold and little so in hot water, from which it crystallizes in pearly scales resembling boracic acid. This substance is insoluble in æther, soluble in alcohol, and is *not* volatile. The solution loses its bitterness when treated with alkalies, which acids do not restore.—*Comptes Rendus*, xv. p. 923.

*Crystalline Substance in Lactuca sativa.*

P. Pagenstecher has observed, that the dry alcoholic extract of *Lactuca sativa* deposits, after a certain time, some crystals of nitre, while the extract itself becomes more liquid from deliquescence. The extract is separated by means of linen from the crystals, and then evaporated to dryness in the water-bath, redissolved in alcohol of 0.815, which removes a soluble portion from a brownish-black insoluble residue. The alcohol acquires a transparent brown colour, which may be removed by digestion with animal charcoal, and leaves behind on spontaneous evaporation a soft crystalline residue of a bitter but not disagreeable taste. It has a brownish colour,



which may be got rid of by washing it with small quantities of alcohol, in which it is somewhat soluble, and it then becomes white. It is indifferent, and does not combine with acids or with bases. It is soluble in water and in alcohol, but insoluble in æther and in essential oils. Sulphuric and nitric acids destroy it. This substance differs from lactucine, this latter having a yellow colour and being very soluble in æther.—Berzelius's *Jahresbericht* for 1842.

*On the Preparation of Hyperchloric Acid.* By M. NATIVELLE.

In the usual manner of preparing hyperchloric acid by decomposing the potash salt with dilute sulphuric acid, a solution of the acid is obtained, which serves, it is true, the purpose of a test for potash, but it is very dilute, and contains only a small portion of the acid in the salt. It is easily observed that the decomposition of the hyperchlorate of potash does not begin before the sulphuric acid has become concentrated by long boiling. At first pure water passes over; by the long application of heat however a portion of the hyperchlorate is decomposed into oxygen and chlorate of potash, and the decomposition of this latter again gives rise to oxygen and oxide of chlorine or chlorine, which gases are in fact evolved during the whole operation. Nevertheless, at the end of the operation a considerable portion of undecomposed hyperchlorate of potash is found in the retort. To prepare hyperchloric acid therefore with the least possible loss, it is requisite to effect the decomposition of the potash salt so rapidly that no great decomposition can occur from the action of the heat; this is attained by employing concentrated sulphuric acid. 500 parts of hyperchlorate of potash, as free as possible from chlorate, are conveyed in powder into a glass retort, upon which 1000 parts of sulphuric acid of 1.834 specific gravity, and free from nitric acid, are added, and then 100 parts distilled water. If the water were to be entirely omitted, a solid crystallized hyperchloric acid would be obtained. The retort is connected by a tolerably long tube with the cold tubulated receiver. No organic substances can be employed for luting, as they would decompose the vapours of the hyperchloric acid with detonation. It is best to choose apparatus which pass into each other, and close without any lute. Heat is gradually applied; the hyperchlorate dissolves, and the acid soon begins to pass over; it must not be too strongly heated, as it would otherwise carry too much sulphuric acid over with it; in fact it should never be heated to boiling. Hyperchloric acid distils at 284° Fahr.: as soon as the contents of the retort appear quite colourless and clear, and the drops only follow each other slowly, while the temperature of the retort has nearly reached the boiling point of sulphuric acid, it is discontinued. The recipient will then on an average contain 300 parts of a liquid of 1.449 specific gravity, but the quantity and density of the product increase when more sulphuric acid has been carried over from less care in conducting the operation.

The product is now shaken with some sulphate of silver to remove the small quantity of chlorine, filtered and treated in a dish with



freshly precipitated well-washed carbonate of barytes, until all sulphuric acid is precipitated and some hyperchlorate of barytes formed. The product now contains only hyperchloric acid and small quantities of hyperchlorate of barytes and hyperchlorate of silver. It is distilled at a gentle heat with the same precaution as in the first case, the pure water which first passes over is put aside, and the recipient reconnected, when what passes over has an acid reaction. The slower the distillation is carried on, the more concentrated is the hyperchloric acid. In summer the recipient is kept cool by iced water, and distillation is carried on until nearly dry, but without decomposing the hyperchlorate of silver and hyperchlorate of barytes. In this manner 500 parts of hyperchlorate of potash afford 150 of a concentrated oily hyperchloric acid of from 1.704 to 1.811 specific gravity.—*Journ. der Pharm.* 1842, p. 502.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the Manufacture of the Chromates of Potash.*

BEFORE proceeding to the description of the methods usually employed in manufacturing these highly important articles, we will give a slight notice of the chrome iron ore, or chromate of iron, the only mineral which occurs in sufficient abundance, and from which the various compounds containing chromic acid are derived. This mineral is found both in the Old and New World, but the best kind is imported from America, and of late from the East Indies. It occurs principally in dense masses, but sometimes in small octahedral crystals, of an iron-black or brownish-black colour, with a brown streak, fracture uneven, and an imperfect metallic lustre. Its specific gravity varies between 4 to 4.5. But this decreases considerably if the ore is much contaminated with matrix. The principal application of this ore is in the preparation of the chromate of potash, for which purpose it must be freed as much as possible by stamping, grinding and sifting from the gang stone or matrix, otherwise the silica and alumina which these contain, form, on calcination with nitre, compounds with the potash, which are then difficult and expensive to separate.

The finely ground and sifted ore is mixed with half its weight of dried nitre, according to others with 67 per cent., and an addition of potash (some manufacturers now use carbonate of potash only), and fused. Sometimes this mixture is placed in pots, which are arranged on the hearth of a reverberatory furnace, or fired in a pottery kiln; but of late the pots have been dispensed with, and the mixture is thrown on to the hearth of a reverberatory furnace, and subjected for several hours to a powerful heat, being occasionally stirred about. When perfectly calcined, the mass (which now consists of peroxide of iron, undecomposed ore, chromate of potash,



caustic potash, silicate and aluminate of potash) is raked out, and dissolved while still hot in water. It is then boiled for some hours in iron vessels, and the clear solution drawn off from the residue, which is washed once or twice with a little water.

In this process the nitre gives off its oxygen to the oxide of chromium and protoxide of iron contained in the ore, forming chromic acid, which then combines with the potash of the nitre and of the carbonate of potash, forming a soluble salt, and the peroxide of iron remains in the residue. When an excess of nitre or of potash has been employed, they easily dissolve silica and alumina, which have then to be removed by nitric or acetic acid.

The clear solutions are now quickly evaporated, and the salt which falls down is removed from time to time with a perforated ladle, and thrown into a basket or draining-box. To form the neutral salt these are again dissolved in water, and the concentrated ley left to crystallize in earthen pans in a hot chamber. When the ley is alkaline to test paper, the neutral salt is formed, but if neutral the acid salt crystallizes from it.

The neutral chromate of potash forms lemon-yellow, opake, six-sided columns, has a bitter disagreeable taste, dissolves in about 2 parts water, not in alcohol, melts at a red heat, loses 32 per cent. water, and appears while fused of a light green colour. It possesses remarkably strong colouring properties,  $\frac{1}{40000}$  still imparting a distinct yellow colour to water, and 20 times its amount of nitre is so intensely coloured yellow that it might easily be mistaken for chromate itself. It consists of 47.51 potash and 52.49 chromic acid.

The bichromate is prepared from the concentrated solution of the neutral salt, by the addition of acetic or some mineral acid. In general acetic acid is employed. Sulphuric acid should be avoided, as this forms a salt with the potash, which being isomorphous with the chromate cannot be separated by crystallization. When the solution is concentrated, the acid salt is thrown down as an orange-coloured powder. This is dissolved in more water, and crystallized by slow evaporation. It forms dark red prismatic crystals, which have a bitter, cooling, metallic taste; dissolve in 10 parts water, not in alcohol, fuse at a red heat, and solidify on cooling to an orange yellow mass, which is transparent in thin layers. It consists of 31.15 potash and 68.85 chromic acid. Paper or linen imbued with this salt scintillate when ignited like tinder.

These salts are frequently adulterated with sulphate of potash, sometimes to the extent of 40 per cent., with nitre and chloride of potassium. The sulphate is best detected by adding to a solution of the chromate, previously acidulated with pure nitric acid, some nitrate of barytes, when sulphate of barytes, which is insoluble in acids, is thrown down; the muriates may be precipitated from a similar solution, diluted, by nitrate of silver, which affords a curdy white insoluble precipitate.



*On the Manufacture of Prussian Blue.* By Prof. E. JACQUEMYS.

My attention was recently drawn by Prof. H. Rose to the formation of cyanogen in the manufacture of coal gas. I first attempted to detect the presence of this body in the lime which is employed in its purification, but soon found that this did not contain any cyanogen, and was consequently led to believe that it had dissolved in the water employed for absorbing the ammoniacal products.

On adding sulphuric acid to these waters till they became slightly acid, and then some salt of the peroxide of iron, I obtained a considerable blue precipitate. Two quarts of the liquid furnished 1.5 grm. prussian blue, and I believe that an establishment for the supply of from 8 to 9 thousand burners might afford daily several pounds of this substance. I must observe that the product so obtained was far from being beautiful, and that the preparation of the sulphate of ammonia from these waters would be complicated, from the necessity of evaporating a large quantity of the liquid; while when the prussian blue is not prepared, these waters are merely partially distilled with lime and the vapours received in dilute sulphuric acid.

It appeared evident that the cyanogen was produced in this case by the action of the carbon on the ammonia, and it is probably owing to this reaction that cyanogen is produced in the ordinary manner of manufacturing prussian blue from animal substances; thus much is certain, that when gaseous ammonia is passed over a mixture of charcoal, iron and potash heated to redness in an iron tube, ferrocyanide of potassium is formed. On treating this mixture with water, I obtained a liquid which, filtered, acidulated with some sulphuric acid, and mixed with persulphate of iron, afforded a beautiful blue precipitate. According to this, the ordinary method of preparing prussian blue by the calcination of animal substances with potash and iron, leaves much to be desired, since the greater portion of the ammonia escapes the action of the potash, iron and charcoal.

These preliminaries have led me to try the preparation of prussian blue by the decomposition of the volatile products resulting from the distillation of bones, and this process has given such results that I am inclined to believe it will offer great advantages in practice.

Two pounds of bones dried in the air were heated gradually in a cast iron retort; the volatile products were conveyed into an iron tube heated to redness, which contained a mixture of charcoal and iron filings impregnated with a strong solution of potash. The volatile products then passed into a cooling apparatus to condense the tar, and then into water rendered acid with oil of vitriol, which absorbed the undecomposed ammonia, from thence into a tube containing potash to absorb the carbonic acid, and lastly into a gasometer.

I obtained in this manner 640 grms. of animal charcoal; the mixture contained in the tube was treated with water: the solution, filtered, acidulated, and then precipitated with a salt of the peroxide



of iron, afforded 0·86 grm. of beautiful prussian blue; and, lastly, I obtained in the gasometer 126 quarts of gas.

The gas thus obtained contained no ammonia; it did not restore the blue colour of reddened litmus paper, had less smell than coal-gas, and gave off no odour on burning; but it did not afford much light. In a second experiment I obtained a gas of good illuminating power, since one burner gave twice as much light as a candle of four to the pound. This difference was, without doubt, owing to the retort and tube having been kept much hotter in the first experiment, and the heat having been continued longer.

The same quantity of animal charcoal will evidently be obtained by this process as by the one usually followed, and at the same time prussian blue or ferrocyanide of potassium, the production of which would occasion very little extra expense if cast iron cylinders were employed for the mixture of charcoal, iron and potash, and a sufficiently large quantity of vapour passed to use up the whole of the potash.

The ammoniacal salts are little coloured, as nearly the whole of the tar is decomposed in the tube, and they would serve as manure without being subjected to any further preparation. In a manufactory constantly in operation there could be nothing to prevent the cylinder destined to furnish the ferrocyanide of potassium being placed in the same furnace as the retorts for the manufacture of animal charcoal. It would suffice to let the retorts communicate with a chamber similar to that employed in the coal-gas establishments, and whence the gases and vapours would pass into the cylinder containing the charcoal, iron and potash. The soluble products would then be conveyed into the two apparatus, the one to receive the undecomposed ammonia, the other the tar; and they might then be conducted into the furnace, or into a lime-purifying apparatus and gasometer, as the gases might in several cases be applied with success for lighting.

This process would offer, in many respects, very considerable advantages, for the manufactories of animal charcoal would diffuse scarcely any bad smell, and they would be able to furnish the agriculturist with ammoniacal salts at a very low price, and at the same time it would admit of a portion of the animal substances, which at present are consumed in the manufactories of prussian blue, being turned to advantage.—*Ann. de Chim. et de Phys.* for March 1843.

#### *New Method for taking Impressions of Medallions, &c. in Copper.*

M. Osann has described a method of taking impressions of medallions, seals, &c. in copper, which is founded on the following principle:—Finely pulverized oxide of copper is reduced in a current of hydrogen at a temperature below redness. The powder obtained is sifted through crape, and placed on the model, which is arranged so as to receive from four to five inches of it in thickness, and to be then pressed in a vice, or first with the hand and then with a ham-



mer. The impressions thus obtained are perfect, but have little cohesion unless heated to redness previous to being exposed to contact with the atmosphere. After this operation they acquire more tenacity than melted copper, and as their volume retracts somewhat, the impression becomes much more distinct.

M. Böttger has shown that copper powder for this purpose is obtained far more easily, of a better quality, and without loss of time, by precipitating a solution of sulphate of copper with zinc, and boiling. The precipitate of copper is then boiled for a few instants in weak sulphuric acid to remove the last traces of oxide or zinc; then washed with water, and dried in a tubulated retort over the water-bath by passing over it a current of hydrogen. This precipitate of copper has so strong an affinity for oxygen that it is difficult to prevent it from changing into protoxide; and if mixed with half an atomic weight of precipitated sulphur and rubbed together, they combine in a few instants with evolution of light forming protosulphuret of copper.—Berzelius's *Jahresbericht*.

## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

*April 4.* (The President in the Chair.) The following communications were read:—

“On the Constitution of the Subsals of Copper,” by J. Denham Smith.

Mr. J. D. Smith states that the results of several analyses of the basic salts of copper made by him not agreeing with the constitution ascribed in many instances to these compounds, induced him to enter into their examination. The mode of forming the salts is first described, then the method of proceeding in the analysis, and finally the composition deduced from such analysis.

*Trisulphate of Copper* was prepared and analysed, and gave by experiment—

		Theory.
Sulphuric acid . . . . .	11.65	11.24
Oxide of copper . . . . .	34.30	33.72
Water . . . . .	4.05	5.14
	<u>50.00</u>	<u>50.00</u>

This salt prepared by another process gave by experiment—

		Theory.
Sulphuric acid . . . . .	7.35	7.31
Oxide of copper . . . . .	21.56	21.94
Water . . . . .	3.61	3.29
	<u>32.52</u>	<u>32.52</u>

The composition deduced from these results nearly agreeing with Brunner's analysis of the subsulphate, is considered as  $\text{SO}^3 \ 3\text{CuO} \ 2\text{HO}$ , in preference to  $2\text{SO}^3 \ 6\text{CuO} \ 3\text{HO}$ . Mr. Smith states, he



could not, after repeated trials, obtain a subsulphate with 3 equivalents of water, as noticed by Berzelius, and therefore considers the third equivalent as hygrometric water.

*Tetrasulphate of Copper* gave the formula  $\text{SO}^3 \cdot 4\text{CuO} + 4\text{HO}$ , as already assigned to it by Professor Graham and Dr. Kane. Dr. Kane states that this salt when heated does not lose water until the temperature rises above  $300^\circ$  Fahr., but then loses all. Mr. Smith however found, that by exposing this salt to a temperature of from  $400^\circ$  to  $470^\circ$  Fahr., it assumes a grass-green colour, accompanied with the evolution of water. The greenish-blue tetrasulphate exposed to the above temperature indicated the composition as  $\text{SO}^3 \cdot 4\text{CuO} \cdot 3\text{HO}$ , arising from the loss of an equivalent of water by the blue subsulphate; when this green salt is moistened, or even boiled with water, it does not change colour nor recombine with the equivalent of water it had lost. Another hydrate of the tetrasulphate exists, which gave upon examination—

Sulphuric acid	4.51
Oxide of copper	19.33
Water	5.54
	<hr/> 29.38

giving the formula  $\text{SO}^3 \cdot 4\text{CuO} \cdot 5\text{HO}$ .

*Pentasulphate of Copper.*—A light powder of a blue colour, the formula of which was found to be  $\text{SO}^3 \cdot 5\text{CuO} \cdot 6\text{HO}$ . Upon heating on a sand-bath until it assumed an olive-green tint, it lost 2 equivalents of water, thus altering the formula to  $\text{SO}^3 \cdot 5\text{CuO} \cdot 4\text{HO}$ . A disulphate of copper is described by Dr. Thompson, who states it to consist of  $\text{SO}^3 \cdot 2\text{CuO}$ , but gives no water as a constituent. After repeated unsuccessful trials to form it according to the directions given under the authority of Dr. Thompson, Mr. Smith is inclined to deny the existence of this salt. Mr. Smith also endeavoured to obtain the octosulphate as described and analysed by Dr. Kane, but after repeated attempts was not successful, and very much doubts its existence.

Mr. Smith then refers to the question respecting the function of the water contained in these salts of copper as advocated by Professor Graham and Dr. Kane, whose views on the subject however he is unwilling to admit; and in conclusion submits the following idea of the constitution of this class of salts, at the same time distinctly refusing to draw any general conclusion from a rule which is in accordance with observation upon one particular class of salts.

That the subsulphates of copper exist as anhydrous sulphate of copper combined with two or more equivalents of hydrated oxide of copper: these compounds in most instances unite with definite proportions of water, precisely in the same manner as some neutral and acid salts combine with water of crystallization, which like them they part with at stated elevations of temperature. This view Mr. Smith considers as completely borne out by the subjoined tabular arrangement of all the subsulphates he had been able to procure:—



*Sulphates of Copper.*

Anhydrous neutral sulphate	$\text{SO}^3 \text{CuO}$ .	
Green neutral sulphate . . . .	$\text{SO}^3 \text{CuO} + \text{HO}$ .	(Thompson.)
Blue neutral sulphate . . . .	$\text{SO}^3 \text{CuO} + 5 \text{HO}$ .	
Trisulphate . . . . .	$\text{SO}^3 \text{CuO} + 2 \text{CuO}$	$2 \text{HO}$ .
1st tetrasulphate . . . . .	$\text{SO}^3 \text{CuO} + 3 \text{CuO}$	$3 \text{HO}$ .
2nd tetrasulphate . . . . .	$\text{SO}^3 \text{CuO} + 3 \text{CuO}$	$3 \text{HO} + \text{HO}$ .
3rd tetrasulphate . . . . .	$\text{SO}^3 \text{CuO} + 3 \text{CuO}$	$3 \text{HO} + 2 \text{HO}$ .
1st pentasulphate . . . . .	$\text{SO}^3 \text{CuO} + 4 \text{CuO}$	$4 \text{HO}$
2nd pentasulphate . . . . .	$\text{SO}^3 \text{CuO} + 4 \text{CuO}$	$4 \text{HO} + 2 \text{HO}$ .

“On the Spontaneous Decomposition of the Chlorate of Ammonia,” by Joseph Wonfor.

The author, after describing the preparation of the chlorate of ammonia, its general characters and composition, and alluding to what had been already published on the subject by Vauquelin, proceeds to detail the change which it undergoes by keeping. This salt gradually passed from its colourless state to a lemon-yellow, giving off an odour dissimilar to any of the oxides of chlorine, which affected the nose powerfully, and irritated the eyes much more than chlorine gas, causing a flow of tears; after some days it exploded spontaneously with great violence, shattering the containing vessel to atoms. Numerous trials were made by Mr. Wonfor to collect the results of this decomposition, but without success, either from the materials exploding in the course of the experiment, or from the gas being evolved with such violence that it was impossible to collect the whole of the products. Nitrogen, chlorine, nitrous acid and water were however proved to be elicited, and the author considers that chloride of nitrogen is gradually formed when the salt changes its colour.

## PATENTS.

*Patent granted to Charles Hancock, Grosvenor Place, Middlesex, for certain Improvements in Printing Cotton, Silk, Woollen, and other Stuffs.*

THE nature of the improvements consists in printing cotton, silk, woollen and other stuffs, with oil or oil colours, without any previous preparations of the stuffs by mordants, sizes, or otherwise; and also in printing them partly with oil or oil colours, and partly with water colours or dischargeable resists, whereby the ordinary process of printing is greatly abridged. The following is the manner in which they are to be performed:—To obtain a suitable medium for the colours, linseed oil, nut oil, or other drying oil (preferring linseed oil, because of its drying quality and its retaining its fluidity at lower temperatures than most others), and raw or burnt Turkey umber are first mixed together, in the proportion of about one gallon of the oil for about every pound of the umber, and this



mixture is boiled over a slow fire, in an open metal pan of large area, and of sufficient depth to allow it to rise without boiling over, continuing the boiling until the mixture gives indication of having nearly parted with most of its evaporable constituents, and taking care to draw the fire before any deposition of carbon takes place, which would have a discolouring effect on the contents of the pan. When these conditions have been duly observed, the resulting product is a viscid substance of a uniform consistency, resembling that of dissolved caoutchouc, flowing freely on the application of a slight heat, or spreading by slight mechanical pressure, and neither soiling or running on being brought into contact with textile fabrics or paper. Or, instead of mixing the umber with the oil, oil alone is used for a medium (but preferring the former), boiling the oil in the same manner as aforesaid till it has a like consistency and like properties. In either case, instead of completing the process at one boiling, it may be effected with less risk of failure, though more slowly, by several boilings, allowing the mixture or the oil to cool each time the fire is drawn. A metal cover may be suspended over the pan by weighted chains or ropes passing over pulleys, so that in the event of the inflammable gases disengaged catching fire, the cover may be instantly lowered and the flame extinguished. When it is desirable, for any particular purpose, to have the medium of a more drying or more adhesive quality than usual, either a little white vitriol litharge, sugar of lead, or other drier, or a little of any suitable resin, is added, as the case may be, to the mixture or oil when in the pan. Before the product of the boiling or boilings has become quite cold, it may be thinned down, if desired, with highly rectified oil of turpentine, or any other sufficient solvent. In order to combine the composition or medium, the nature and preparation of which have been described, with any of the pigments or other matters suitable for the printing of cotton, silk, woollen, and other stuffs, the combination is best effected in vessels heated by steam, according to the mode usually adopted in colour manufactories and laboratories. When the colours are to be applied to the stuffs, it may be done without any previous preparation of the stuffs, by mordants, sizes, oils, or otherwise, and by means either of cylinder printing machines, or plates, or blocks. If the medium has been previously thinned sufficiently by oil of turpentine or other solvent, the colours may be applied in a cold state; or if the medium has not been so previously thinned, then, in order to make the colours flow freely, the colour-troughs, tearing-sieves, plates and cylinders must be kept warm by steam, or some other transmitter of a gentle heat, by any of the well-known methods commonly employed for such purposes. The colours do not rest on the surface, but penetrate the body of the stuff, and this without running. Any smell imparted by the oil or turpentine may be dissipated by exposure to the air. The medium possesses of itself a considerable degree of colour, and may be used for printing stuffs without the intermixture of any other colouring matter. The stuffs so printed on may be of any colour or colours. In the processes hitherto de-



scribed, it has been supposed that the figures, designs or patterns are to be printed with the oil or oil colours ; but, instead thereof, the figures, designs, or patterns, may be produced, in the manner of resists, by some fugitive water-colour gum or paste, and an oil or oil colour, prepared as before directed, be made use of to produce only the general ground, the stuff being washed afterwards to discharge the resist, and then aired, as before directed, to get rid of any smell of the oil or turpentine.—Sealed Feb. 8, 1842.

*Patent granted to JAMES CRUTCHETT, London, for Improvements in manufacturing Gas, and an Apparatus for consuming Gas.*

These improvements in the manufacture of gas are generally for mixing with coal gas, oil gas, or other gas used as a source of light or heat, any required proportion of atmospheric air or oxygen, or of atmospheric air and oxygen, in order to cause more perfect combustion ; also for introducing as an additional element into such compound or mixture of gases, vapour of naphtha, or other volatile hydro-carbon, so as to form a triple combination of combustible gas, combustible vapour, and gas capable of supporting combustion, from which light and heat may be obtained more economically than from ordinary gas. The proportions of atmospheric air to be introduced vary with the quality of the gas. As much as 25 per cent. of atmospheric air with coal gas has been used with advantage, but from 5 to 15 per cent. is a more usually advantageous proportion ; with oil gas various proportions up to 80 per cent., or in some cases even more, may be used, according to the quality of the gas, and the light or heat required.

The mixture is best effected by certain apparatus, by means of which the pressure of the gas itself is applied as a moving power to draw in and mix with the gas, previous to its issuing from the burners, the desired proportion of air-gas or vapour, or of any combination thereof.

The author claims—

1. The admixture of atmospheric air, or other supporter of combustion, in any required proportions with coal gas, or other illuminating gas, previously to its issuing from the burner.

2. The plan of employing the pressure of the stream of gas by the intervention of suitable apparatus to draw in the air, gas, vapour, or any combination thereof which it may be desired to introduce.

3. The plan of using a drum revolving in water, to draw in air, gas, vapour, or any combination thereof ; and the plan of connecting the said drum with the drum of a gas meter, in order that it may be driven thereby.

4. The triple compound of combustible gas with air, or gas capable of supporting combustion, and vapour of volatile hydro-carbon, for the purpose of combustion.—Sealed July 12, 1842.



# THE CHEMICAL GAZETTE.

No. XIV.—May 15, 1843.

## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Oil of Gaultheria procumbens.* By M. A. CAHOURS.

THIS oil, which has recently been employed in perfumery under the name of oil of Winter-green, derives its origin from one of the heaths, the *Gaultheria procumbens*.

The oil is heavier than water, in which it is scarcely soluble, and consists almost entirely of a substance which boils exactly at the temperature of 435° Fahr. without being decomposed. It was found by analysis to be composed in 100 parts of—

Carbon .....	63·17	63·08	63·13
Hydrogen .....	5·46	5·47	5·38
Oxygen .....	31·37	31·45	31·49

which would lead to the formula  $C^{32}H^8O^6$ ; but this formula may be represented by that of the salicylate of methylene, and we have then—



I was therefore induced to compare these two bodies, in order to verify the accuracy of my hypothesis, and soon became convinced of their perfect identity. Moreover, on treating this oil with a solution of potash of 1·449 spec. grav., to which I had added fragments of this alkali, and submitting the whole to distillation at a moderate heat, I obtained in the recipient a product which, treated several times with lime, afforded a liquid more volatile than water, and burned with a pale blue flame. The residue in the retort, treated with water, gave, on the addition of a mineral acid, an abundant precipitate of salicylic acid.

On treating the commercial oil of *Gaultheria*, or the salicylate of methylene, with fuming nitric acid, the temperature is considerably raised. Scarcely any nitrous acid vapours are disengaged when the mixture is kept cool, and very soon the whole liquid solidifies to a mass of crystals, which, washed with water and purified by several crystallizations from alcohol, are obtained in the form of minute acicular needles of a yellowish-white colour.

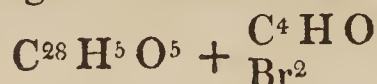
This compound was found to have the composition  $C^{32}H^7NO^{10}$ , which may be decomposed into





indicating this compound to be the anilate or indigotate of methylene.

Bromine and chlorine, on the contrary, appear to act on the portion of the oil constituting the methylic base. Thus the bromine compound afforded on analysis numbers which led to the formula  $C^{32} H^6 Br^2 O^6$ , which might be considered as



in which we find the compound analogous to the chlorated product of M. Malaguti.

From the above it will be evident that analysis and synthesis agree in proving—1, the identity of the oil of *Gaultheria procumbens* with salicylic æther of methylene; 2, that an acid may be extracted from this oil, which is identical with the salicylic acid obtained from the hydruret of salicylc by M. Piria, and from coumarine by M. Delalande\* ; 3, fuming nitric acid converts it into a body belonging to the same series, and in which we meet with indigotic acid, which it had hitherto been impossible to obtain except from indigo, and which Gerhardt had formed by the action of nitric acid on salicylic acid.

Without attempting at present to explain how the methylic æther had originated in order to enter into the constitution of this oil, or of the exact form in which it is therein combined, I will direct the attention of chemists to a very remarkable circumstance, viz. that pyroligneous spirit, which had never been observed except in pyrogenous products, occurs in this case in a substance formed under the influence of vegetation.

Although presenting the composition of a neutral æther, the oil of *Gaultheria* behaves like a true acid. Thus treated with caustic potash or soda, it forms crystalline compounds soluble in water and in alcohol; the addition of an acid separates the oil unchanged; it is only in the course of a day that the whole is converted into salicylic acid, which may be obtained by treating the mass, dissolved in water, with weak hydrochloric acid. I have moreover observed that these properties, otherwise so strange, are also met with in the oil obtained by distilling salicylic acid with a mixture of pyroligneous spirit and concentrated sulphuric acid, and that they also occur in an analogous compound, the anilate of methylene; an æther likewise formed by an acid containing 5 atoms of oxygen.

The chlorine compound, distilled with cyanide of mercury, affords chloride of mercury and a white combination, which sublimes, and probably contains cyanogen in the place of chlorine.

Iodine dissolves in the oil, but it does not appear to have any action on it.

Ammonia behaves in a different manner to the potash and the soda, and its action appeared to give rise to phænomena full of interest.—*Comptes Rendus*, April 17, 1843.

\* See this Journal, p. 198.



*Composition of the Sulphite of Alumina.*

This salt is obtained, according to M. Gougginsperg, by dissolving pure freshly-precipitated alumina in cold hydrated sulphurous acid to saturation, and heating the acid solution to 165° Fahr., when a white powder is thrown down with considerable disengagement of sulphurous acid. The liquid when not heated affords on evaporation in vacuum only a gummy mass, which is gradually changed on exposure to the atmosphere into sulphate of alumina. The solution filtered from the white powder does not contain a trace of alumina. The white powder is insoluble in water, soluble in sulphurous acid, affords when exposed to heat sulphurous acid, and leaves behind on ignition pure alumina; it easily passes into the sulphate in a moist atmosphere. It contains 42.6–43.6 alumina and 26.59–27.5 sulphurous acid, and is therefore represented by the formula  $\text{SO}^2 + \text{Al}^2 \text{O}^3 + 4\text{aq.}$ —*Ann. der Chem. und Pharm.* for Jan. 1843.

*On the Composition of Inuline. By M. CROOCKEWIT.*

The inuline from *Taraxacum* and *Helenium* was found by Mulder to be composed according to the formula  $\text{C}^{24} \text{H}^{20} \text{O}^{20}$ , polymeric therefore with starch. Subsequently Mr. Parnell deduced, from some analyses of the inuline derived from the root of the dahlia, a somewhat different formula\*. Both these results are confirmed by the author, so that the two kinds of inuline are different; that from the dahlia is, both in its easily soluble modification as well as in that more difficult of solution,  $\text{C}^{24} \text{H}^{21} \text{O}^{21}$ . Several varieties however of inuline seem to exist, through which these two kinds pass as it were into each other. The difference depends solely on the amount of water.

The inuline from dahlia was prepared from roots peeled in January,—cut into small pieces, and extracted with cold water,—by boiling them in water, evaporating the filtered solution, which did not deposit anything on cooling, and treating the residue with water, which left the inuline behind. This inuline may be separated by boiling water into a modification difficult of solution (*a*), which is deposited on cooling in the form of a white powder, and into a more easily soluble form (*b*), which can only be obtained by evaporation. The inuline from *Rad. Helenii* was prepared in the same manner; it forms only *one* modification, which is precipitated on the cooling of the hot solution. It was purified from any adherent helenine by means of alcohol.

	Inuline from <i>Dahlia</i> .			Inuline from <i>Rad. Helen.</i>	
	<i>a.</i> at 248° F.	<i>a.</i> at 320°.	<i>b.</i> at 284°.	at 266°.	
Carbon . . . .	43.95	43.94	44.01	44.30	44.41
Hydrogen . .	6.20	6.28	6.21	6.23	6.26
Oxygen. . .	49.75	49.78	49.78	49.47	49.33

The inuline from *Rad. Helenii* afforded in this case somewhat less carbon than in Mulder's analyses, so that it might almost be expressed by  $24\text{C}$ ,  $20\frac{1}{2}\text{H}$ ,  $20\frac{1}{2}\text{O}$ , or a kind of intermediate form. It

\* See 'Philosophical Magazine' for August 1840.—Ed.



cannot be denied that the length of boiling (inuline is entirely converted into sugar by boiling for 15 hours), and other circumstances in the mode of preparation, have considerable influence on the amount of water of the inuline. Its solubility increases with its amount of water; moreover soluble inuline appears to be derived from sweet roots, and the less soluble modification from such as are not sweet, but the one kind passes into the other by frequent treatment with hot water. The extracts of *Helenium* and *Taraxacum* probably contain very little inuline, but in its stead sugar.

Warm solutions of inuline not only reduce salts of silver and copper, but even sugar of lead in the presence of ammonia; in the latter case formic acid is produced at the same time. Inuline dissolves in fuming nitric acid, but no xyloidine is precipitated from the solution by water.

Both kinds of inuline were precipitated from equally concentrated warm solutions with the same quantities of sugar of lead and ammonia in an atmosphere free from carbonic acid, the precipitate collected, pressed, taken from the filter, dried for some days over sulphuric acid and potash at the usual temperature, and for a few hours at 212° Fahr., when they melted somewhat. The analyses afforded in 100 parts—

From the Inuline Oxide of Lead from <i>Helen</i> .				From the <i>Dahlia</i> .	
Carbon.....	21.52	19.13		25.20	17.38
Hydrogen ....	2.85	2.39		3.32	2.16
Oxygen .....	22.56	20.61		27.56	18.32
Oxide of lead ..	53.07	57.87		43.92	62.14

The first lead compound of the inuline from *Helen*. is therefore  $C^{24}H^{18}O^{18} + 3PbO$  (oxide of lead according to theory, 52.02); the second  $C^{24}H^{18}O^{18} + 4PbO + aq.$  (according to theory, 58.41 oxide of lead). The first combination of the inuline from dahlia is, on the other hand,  $C^{32}H^{24}O^{24} + 3PbO$  (44.85 PbO), and the second  $C^{32}H^{24}O^{24} + 6PbO$  (61.92 PbO).

These compounds contain besides inuline another body, which is soluble in cold water, and which may be obtained by decomposing the lead salt suspended in water with sulphuretted hydrogen, evaporating the filtered solution, and extracting the residue with a little cold water. It may also be obtained from the liquid filtered from the lead salt. It is dark brown, not sweet, and forms, when purified by repeated treatment with cold water from inuline, a dark brownish-red friable substance more or less soluble in alcohol. It is obtained in larger quantity from dahlia; it is formed by the action of acetic acid on inuline. It agrees with apoglucinic acid, and most probably therefore some glucinic acid\* is formed by the action of the oxide of lead on the inuline; after extracting the apoglucinic acid with cold water, the substance remaining has all the properties and the composition of *Helenium*-inuline. It consists of

\* Glucinic acid was discovered a few years since by M. Peligot. It is formed by the action of acids on non-crystalline sugar. Its composition is represented by the formula  $C^8H^5O^5$ . On boiling its aqueous solution for some time, exposed to the atmosphere, it is converted into apoglucinic acid =  $C^{18}H^9O^8$ .—Ed. *Chem. Gaz.*



	<i>Dahlia.</i>	<i>Helenium.</i>
Carbon .....	44.22	44.40
Hydrogen .....	6.29	6.40
Oxygen .....	49.49	49.20

It is evident from these experiments that inuline is obtained by different modes of preparation and from different plants with a variable amount of water, and has no constant composition. Pure inuline is  $C^{12}H^{10}O^{10}$ ; when combined with bases it is partially converted into glucinic acid, which is changed by evaporation with exposure to the atmosphere into apoglucinic acid. Inuline is the more pure and free from sugar the more difficult it is soluble in cold water. —*Ann. der Chem. und Pharm.*, xlv. p. 184.

*On some Hyposulphates. By M. RAMMELSBERG.*

The author has prepared and examined some hyposulphates, the constitution of which had not hitherto been determined by analysis, and also some combinations of these salts with ammonia.

*Hyposulphate of Nickel* is obtained on decomposing sulphate of nickel with hyposulphate of barytes in long thin prisms of a green colour, which are easily soluble in water. It is decomposed by heat into sulphurous acid and sulphate of nickel. It contains 22 per cent. oxide of nickel, and is therefore  $NiO, NO^5 + 6aq.$  (theoretical amount of  $NiO = 22.97$ ).

*Hyposulphate of Nickel and Ammonia.*—When ammonia is added to a solution of the nickel salt, the double compound is immediately deposited as a blue crystalline powder. When dissolved with the assistance of heat in ammonia, it is obtained on cooling perfectly pure, and forms small prismatic crystals, in which two lateral surfaces are so broad, that the crystals have in general the appearance of thin laminae of a beautiful violet-blue colour. The salt is decomposed by water into ammonia and oxide of nickel. It consists of—

	Found.	Atoms.	Calculated.
$NiO$ .....	23.36	1	23.30
$S^2O^5$ .....		1	44.77
$NH^3$ .....	30.09	3	31.93

On exposure to heat in a closed tube this salt affords free ammonia, a sublimate of sulphite and sulphate of ammonia, and a partially yellow and in part black residue, consisting of sulphate of nickel and sulphuret of nickel.

*Hyposulphate of Cobalt and Ammonia.*—On mixing a concentrated solution of the hyposulphate of the protoxide of cobalt with ammonia, and subsequent warming, a green precipitate and a violet-red liquid are obtained, from which on cooling and standing red crystals are deposited. On evaporation the solution becomes opaque, from the separation of the hydrate of the oxide of cobalt, and finally hyposulphate of ammonia crystallizes from it. The red crystals form rectangular quadrilateral prisms, very soon become brown and lose their lustre. Treated with water they afford a pale reddish solution,



which contains, besides free ammonia, hyposulphuric acid and a small quantity of cobalt, and moreover a green flocculent precipitate free from ammonia, and which dissolves in hydrochloric acid in the cold with evolution of chlorine, and contains hyposulphuric acid. It appears to be a basic oxide salt. The double salt consists of—

	Found.	Atoms.	Calculated.
$\text{Co}^2 \text{O}^3$ .....	25.27	1	26.51
$\text{S}^2 \text{O}^5$ .....	44.60	2	46.09
$\text{N H}^3$ .....	27.67	5	27.40

*Hyposulphate of Zinc and Ammonia* is precipitated on the cooling of a hot saturated solution of the hyposulphate of zinc in ammonia, and forms small prismatic crystals. It is decomposed by water like the nickel salt. Its composition is expressed by  $\text{ZnO} + \text{NH}^3 + \text{S}^2 \text{O}^5$ .

*Hyposulphate of Cadmium and Ammonia*.—This combination is obtained in a similar manner, but it cannot easily be made to crystallize, as the solution is decomposed on evaporation at the ordinary temperature, with the assistance of heat, and also by the addition of alcohol. The salt was obtained after some time by the first method in the state of a crystalline powder, but not free from the simple salt, and was probably mixed also with the hydrate of the oxide of cadmium. It undergoes the same decomposition in water as the preceding.

*Hyposulphate of Silver and Ammonia*.—On the cooling of the solution of hyposulphate of silver in ammonia, this combination crystallizes in rhombic prisms. They have a strong lustre, but on account of their minuteness could not be more accurately determined. They become gray by exposure to light, dissolve wholly in water, and consist of—

	Found.	Atoms.	Calculated.
$\text{AgO}$ .....	50.52	1	50.13
$\text{S}^2 \text{O}^5$ .....		1	31.16
$\text{NH}^3$ .....	15.65	2	14.82
Aq. ....		1	3.89

On exposure to heat this salt affords water, free ammonia, a sublimate of sulphite of ammonia, and at last some free sulphurous acid, and sulphate of silver is left behind.—Poggendorff's *Annalen*, vol. lviii. p. 295.

*On the Employment of Naphthaline in Psoriasis.* By M. EMERY.

M. Emery has been employing concrete naphthaline in the treatment of psoriasis, on his patients in the hospital of St. Louis, and, up to the present time, he has met with great success. He has tried it in 14 cases, and in 12 it succeeded. In the two in whom it failed, one was a woman 30 years of age, who had been afflicted for 8 years with psoriasis gyrata; and the other was a young man who had suffered for several years from lepra vulgaris; and, in the latter, the treatment was persevered in for 2 months, but no improvement having taken place, it was given up for the pitch ointment, which



effected a cure in two months. The mode in which M. Emery applies it is in the form of ointment, in the strength of  $\zeta$ ss. to  $\zeta$ i. of lard. He concludes by saying that the number of cases in which it has been tried, is not sufficiently numerous to enable us to conclude anything precise about its efficacy in this disease, but they are sufficient to encourage a further trial of it. The inconveniences attending its use are, its strong smell, and occasionally severe inflammation of the skin, which must be combated by poultices. M. Emery always commenced the treatment by the application of poultices for 5 or 6 days, so as to have the scales completely removed before the ointment was applied.—*L'Expérience*, Oct. 6, 1842, as inserted in the *London and Edinburgh Monthly Journal of Medical Science* for May 1843.

*On the Reciprocal Action of Sulphuret of Carbon and Æthal.*  
By MM. PROVOSTAYE and DESAINS.

Æthal dissolves in sulphuret of carbon in the cold; the saturated solution is perfectly clear, but on shaking becomes somewhat troubled. When pulverized hydrate of potash is added to it, a reaction ensues, and after some hours a very thick and porous mass is obtained, of a dirty yellow colour with some reddish spots. If it be then gently heated with 3 to 4 times its volume of alcohol of 0.828 spec. grav., a bright yellow solution is obtained, and a small quantity of a dark reddish-brown oil settles, which may easily be separated by decantation; it is strongly alkaline, but was not further examined. The alcoholic solution deposits on cooling a very light voluminous substance, which may be purified by washing with cold alcohol of 0.848, re-solution in as little alcohol as possible of 0.828, recrystallization and repeated washing with alcohol, and at last with æther. The whole of the æther can only be expelled by long standing in vacuum over sulphuric acid.

The new substance forms, when dried in the air and freed as much as possible from æther, a very delicate, white, crystalline, highly hygroscopical powder, which is insoluble in water, with which it is even difficult to moisten it, although it is finally decomposed by it. It dissolves very sparingly in cold, but abundantly in hot alcohol and æther, with a yellow colour; the solutions are neutral. On exposure to heat the combination melts and gives off vapours, which at first smell like leek, subsequently of sulphuret of carbon, and lastly of æthal; at a higher temperature it ignites and burns, leaving behind an alkaline ash which contains much sulphuret of potassium. The analysis was made with chromate of lead, and a current of oxygen passed over it towards the conclusion. The hydrogen was determined in a separate experiment, in which the combustion tube was dried very carefully, the mixture of the substance with chromate of lead introduced, and the tube then filled with chromate of lead intermixed with some copper turnings. The sulphur cannot be ascertained by means of aqua regia, as this forms chloride of sulphur. Nitric acid decomposes the combination, with evolution of nitrous acid and



separation of æthal, but does not oxidize the sulphur completely. The oxidation has therefore to be made in a combustion tube by means of a mixture of carbonate of soda, chlorate of potash and oxide of copper; the residue is immediately extracted with hot water, and a little hydrochloric acid added to the solutions, which are then precipitated with chloride of barium. The potash is very easily determined, as on careful ignition nearly all the potash of the combination remains behind as sulphate of potash, so that it is only necessary to add a few drops of sulphuric acid to the contents of the crucible. The analysis afforded—

	Found.	Atoms.	Calculated.
Carbon . . . . .	57·00	34	57·18
Hydrogen . . . . .	9·29	33	9·26
Oxygen . . . . .	2·31	1	2·23
Sulphur . . . . .	18·04	4	18·04
Potash. . . . .	13·36	1	13·29

The combination is therefore  $C^{32}H^{33}O + 2CS^2 + KO$ , *i.e.* a salt corresponding entirely to the xanthogenate of potash, in which the oxide of cetylc has taken the place of the oxide of ethyle.

The barytes salt of the new acid may also be prepared by the direct action of barytes on the solution of æthal in sulphuret of carbon; it contains 30·9 per cent. barytes.

The alcoholic solution of the potash salt forms, with alcoholic solution of corrosive sublimate, a very white caseous precipitate, which is decomposed by edulcoration; with nitrate of silver a canary-yellow precipitate, which very soon becomes black; with acetate of lead a white precipitate, which becomes black with time; with zinc salts, a white gelatinous precipitate. Xanthogenate of potash does not precipitate salts of zinc, and the silver precipitate is more constant.

When some crystals of xanthogenate of potash are thrown into dilute hydrochloric acid the liquid becomes milky, and xanthogenic acid is deposited. The new acid behaves differently; its potash salt becomes elastic in dilute hydrochloric acid, first of a flesh-colour, and then again white. The white substance which remains undissolved is only æthal, so that the new acid cannot be separated in this manner without being decomposed.—*Annal. de Chem. et de Phys.*, Dec. 1842, p. 494.

#### *On the Composition of Gelatine. By GOUDÆVER.*

Professor Liebig has, in accordance with Scherer's analysis, adopted for gelatine the formula  $C^{48}H^{41}N^{7\frac{1}{2}}O^{18}$ , while M. Mulder deduced from his analysis of gelatine, and from its combination with chlorous acid, the formula  $C^{13}H^{10}N^2O^5$ , or  $C^{52}H^{40}N^8O^{20}$ . M. Goudæver has repeated the analyses with pure fish-gelatine, precipitated by alcohol from a solution of isinglass, and containing not a perceptible trace of ash. He also convinced himself that the gelatine dried at 212° Fahr. gives off some water up to 248° without being decomposed, that therefore Scherer had found too much hy-



drogen. The analysis of the fish-gelatine, dried at  $248^{\circ}$  with oxide of copper and chlorate of potash, afforded however—

	Found.		Atoms.	Calculated.
Carbon . . . .	49.81	50.00	52	50.37
Hydrogen ..	6.73	6.72	40	6.33
Nitrogen ..			8	17.95
Oxygen . . . .			20	25.36

When pure gelatine is boiled for 55 hours with water it no longer gelatinizes on evaporation, is easily soluble in water, agglomerates into flakes in nearly anhydrous alcohol and æther, and can after drying be easily reduced to a white powder. In this change it has combined with 1 atom of water—

	Found.		Atoms.	Theory.
Carbon . . . .	49.50	49.56	52	49.67
Hydrogen ..	5.56	6.54	41	6.39
Nitrogen ..	17.36	17.36	8	17.69
Oxygen . . . .	26.58	26.54	21	26.25

The same combination is obtained when chlorite of gelatine is dissolved in ammonia, evaporated, and the residue extracted with alcohol; or a solution of gelatine treated direct with chlorine, saturated with ammonia, and then extracted with alcohol. When a solution of gelatine which has been boiled for a long time is treated with chlorine gas, two combinations are formed, one frothy and floating on the surface, the other gelatinous which subsides. Both lose much chlorous acid in drying.

Moreover, according to the combinations of gelatine with tannic acid, the formula of the gelatinizing unchanged gelatine is  $C^{13}H^{10}N^2O^5$ , which is quadrupled on its becoming hydrated by boiling and in its combination with chlorous acid.—*Ann. der Chem. und Pharm.* for Feb. 1843.

#### *Action of Weak Acids on Copper Vessels plated by the Electrottype Process.*

TO W. FRANCIS.

MY DEAR SIR,—I have this week had brought under my notice a fact of great importance in domestic œconomy and practical pharmacy, viz. that copper vessels, as saucepans, extract pans, &c., silvered by the electrottype process, are acted upon by weak acids, as lemon-juice and vinegar, if allowed to remain in them for a short time. This must arise from the deposited silver being so porous as to allow the acids to permeate its substance, and the action is most likely assisted by the formation of a galvanic circuit. The presence of copper was strongly evidenced by the usual tests. Should you think this worthy of a space in your useful Journal you are at liberty to insert it.

*Apothecaries' Hall.*

Yours truly,  
R. WARINGTON.



*Recent Researches on the Chemical Composition of Bones.*

In a former Number we gave an account of some experiments which Dr. Frerichs\* had instituted on the composition of bones; the present article, containing the results of numerous researches that have lately been made on this interesting subject, will serve to complete that notice.

A. *Normal Bones*.—Dr. Marchand analysed the upper thigh-bone, freed from fat and periosteum, of a man 30 years of age. He found it to contain—

Cartilage insoluble in hydrochloric acid . . . . .	27·23
Cartilage soluble in hydrochloric acid . . . . .	5·02
Vessels . . . . .	1·01
Basic phosphate of lime . . . . .	52·26
Fluoride of calcium . . . . .	1·00
Carbonate of lime . . . . .	10·21
Phosphate of magnesia . . . . .	1·05
Soda . . . . .	0·92
Chloride of sodium . . . . .	0·25
Oxides of iron and manganese, and loss . . . . .	1·05
	<hr/> 100·

For the sake of comparison we also give that made some years ago by Berzelius:—

Cartilage completely soluble in water . . . . .	32·17
Vessels . . . . .	1·13
Basic phosphate of lime, with a little fluoride of calcium . . . . .	53·04
Carbonate of lime . . . . .	11·30
Phosphate of magnesia . . . . .	1·16
Soda, with a very small quantity of chloride of sodium . . . . .	1·20
	<hr/> 100·

Marchand observed that on treating the bones with hydrochloric acid, about 5 per cent. of organic constituents (cartilage soluble in hydrochloric acid) were dissolved, which are thrown down on precipitating the phosphate of lime by ammonia. The fluorine was determined according to Wöhler's method, which consists in mixing the substance intimately with pure silica, then bringing it into a small flask, treating it with boiled highly concentrated sulphuric acid, closing the flask quickly with a cork, into which a small tube, drawn out to a point and filled with fused chloride of calcium, is fitted air-tight. The apparatus is now weighed, then heated as long as any gaseous fluoride of silicium is given off, the last traces of which are removed under the air-pump. The loss in weight indicates the amount of the fluoride of silicium, of which 1·395 equal 1·0 fluorine. The coincidence of this analysis with that made long since by Berzelius is very great.

B. *Fossil Bones*.—Marchand has analysed,—1, a bone of a bear from the Gailenreuth cavern, found near the soil; 2, a similar bone



from a considerable depth; 3, upper thigh-bone of a fossil stag, from an unknown locality, with the following results:—

	1.	2.	3.
Animal substance . . . . .	4·20	16·24	7·25
Phosphate of lime . . . . .	62·11	56·01	54·15
Carbonate of lime . . . . .	13·24	13·12	19·26
Sulphate of lime . . . . .	12·25	7·14	12·24
Fluoride of calcium . . . . .	2·12	1·96	2·08
Phosphate of magnesia . . . . .	0·50	0·30	2·12
Silica . . . . .	2·12	2·15	
Peroxide of iron, manganese, &c. . .	3·46	3·08	2·90
	<u>100·00</u>	<u>100·00</u>	<u>100·00</u>

It will be seen that the organic substance has decreased less in the bone found at the greatest depth. The quantity of fluoride of calcium and the large amount of carbonate of lime in the stag-bone are remarkable. The gypsum is naturally the result of external action.

Bischoff has made a series of experiments on some fossil bones recently found near Oelsnitz, with a view to discover some easily applicable chemical means of distinguishing between fossil and recent bones. He found that the fossil bones dissolve the more rapidly in muriatic acid, and leave behind a smaller residue the older they are. The hydrochloric solution of the fossil bones was found to be strongly coloured, and contained much iron. The cartilage of the fossil bones dissolved partially in boiling water, almost entirely in caustic potash, and completely after long digestion in hydrochloric acid.

*C. Pathologically altered Bones.*—The bones in *mollities ossium* have been submitted to examination by several persons. Dr. Rees found in one individual 32·5 per cent. of incombustible substance in the fibula, 30·0 in the rib, and 26·1 in the vertebra. Bogner found, in the under-mentioned bones of a man 32 years of age, and suffering greatly from *Mollities ossium*—

	Skull.	Radius.	Femur.	Patella.
Cartilage and vessels . . . .	65·85	63·42	69·77	70·60
Phosphate of lime . . . . .	26·92	28·11	23·50	23·23
Phosphate of magnesia . . .	0·98	1·07	0·97	0·94
Carbonate of lime . . . . .	5·40	6·35	5·07	5·03
Soda and traces of iron and manganese . . . . .	0·85	1·05	0·69	0·64

Dr. Marchand obtained the following results from the examination of several bones of a rhachitic child:—

	Dorsal vertebræ.	Radius.	Femur.	Sternum.
Cartilage . . . . .	75·22	71·26	72·20	61·20
Fat . . . . .	6·12	7·50	7·20	9·34
Phosphate of lime . . . . .	12·56	15·11	14·78	21·35
Phosphate of magnesia . . .	0·92	0·78	0·80	0·72
Carbonate of lime . . . . .	3·20	3·15	3·00	3·70
Sulphate of lime and sul- phate of soda . . . . .	0·98	1·00	1·02	1·68
Fluoride of calcium, chlo- ride of sodium, iron, &c. .	1·00	1·20	1·00	2·01



These results confirm therefore the supposed decrease of the earthy phosphates in *Mollities ossium*; and this decrease, when the disease is general, is most considerable in the bones of the vertebral column and the tubular bones of the extremities. The phosphate of lime is secreted by the urine, and in a case examined by Dr. Marchand the urine contained from 5 to 6 times more phosphate of lime than usual; at the same time the urine abounds in lactic acid. In the treatment of this disease, attention should be especially directed to limiting the formation of lactic acid by avoiding milk and amylaceous and saccharine nutriment, and a more animal diet, rich in phosphate of lime, should be substituted. The cartilage of *rhachitic* bones affords, according to Marchand, neither gelatine nor chondrine on boiling. Marchand has moreover examined *arthritic* bones (the upper thigh-bone covered with concretions at the joint, and the apparently sound shoulder-bone of a man afflicted with gout), and also found a decrease of the earthy constituents throughout the entire osteological system, viz.—

	Thigh-bone.	Shoulder-bone.
Animal substance . . . . .	46.32	45.96
Phosphate of lime . . . . .	42.12	43.18
Phosphate of magnesia . . . . .	1.01	0.99
Carbonate of lime . . . . .	8.24	8.50
Fluoride of calcium, &c. . . . .	2.31	1.37

The composition of the concretions on the thigh-bone bore no relation to the composition of the bone; they were found to consist of 34.2 lithate of soda, 2.12 lithate of lime, 7.86 carbonate of ammonia, 14.12 chloride of sodium, 6.80 water, and 32.53 animal substance.

[The conclusion in our next.]

## ANALYTICAL CHEMISTRY.

*On the Behaviour of the Peroxide of Mercury towards Chloride of Calcium.* By M. HOCHSTETTER.

THE property of a solution of chloride of magnesium, being decomposed by peroxide of mercury into perchloride and pure magnesia, affords, as is well known, a very simple means of separating magnesia from the alkalies and determining its quantity. This behaviour induced Berzelius to point to the probability of a very simple mode of separating lime and magnesia, supposing that chloride of calcium would resemble in its behaviour the alkaline chlorides. This induced the author to make the following experiments on the subject:—An acid solution of chloride of calcium was boiled for a considerable time with the peroxide; at first no action of the two substances on each other was apparent, but as soon as the liquid was rendered more concentrated by evaporation it became turbid. On continuing the boiling still longer the amount of peroxide evidently decreased, and large quantities of white flakes separated. The mass was then dried at a gentle heat, and again treated with



some water, a small quantity of which occasioned no perceptible change; but on the addition of much water an abundant reddish-brown precipitate was immediately formed. The chloride of calcium had evidently been decomposed; but this was only apparent at a certain degree of concentration of the solution, at which the hydrate of lime which separates is insoluble in the liquid. But as soon as the hydrate of lime was again rendered soluble by the addition of water, the solution of perchloride of mercury which had originated became likewise decomposed—a process which was evident in the formation of the reddish-brown precipitate, which on examination was found to be composed of—

Peroxide of mercury. . . . .	95.4
Chlorine . . . . .	3.0
Lime . . . . .	1.2
	<hr/> 99.6

The lime was present in the precipitate in the form of a carbonate, and owed its origin to the influence of the atmosphere during the experiment, and does therefore not belong to the mercurial compound, which agrees very nearly in composition with the tribasic chloride of mercury; its formation is easily explained from the employment of an acid solution of chloride of calcium, and the free perchloride of mercury necessarily formed.

A neutral solution of chloride of calcium was equally decomposed under the above circumstances, and formed, on being mixed with water, a precipitate containing less chlorine than the above, but it was also found to be contaminated with carbonate of lime.

Although a very dilute solution of chloride of calcium does not undergo any decomposition by contact with peroxide of mercury, yet the decomposition resulting under the circumstances above described, seems to render the employment of the peroxide of mercury not fit for the accurate separation of lime and magnesia.—*Journ. für Prakt. Chem.*, xxvii. p. 373.

## PHARMACOLOGY.

### *On the Gurjun.*

THIS is a thin balsam which is well known in all the Indian bazaars. It is the product of a tree, the *Dipterocarpus laevis*

To procure the balsam, Dr. Roxburgh informs us, a large notch is cut in the trunk of the tree near the earth, where a fire is kept up till the wound is charred, soon after which the liquid begins to ooze out; a small gutter is cut in the wood to conduct the liquid to a receiver. The average produce is said to be 40 gallons in each season, during which it is necessary to cut off the charred surface from time to time, and burn it afresh. The process is performed during the cold season.

The gurjun balsam varies in consistence from that of thick honey to a light oily liquid. The colour of a fine specimen of thick gur-



jun obtained from Captain Jenkins of Assam, was a pale gray; specimens sent from Rangoon by Mr. Speir were a light brown. As found in the bazaar this substance generally occurs as a brown, oily-looking, semi-transparent liquid, in odour strongly resembling a mixture of balsam of copaiba with a small portion of naphtha. The spec. grav. is 0.962. It is totally insoluble in water, freely in warm alcohol of 0.835, and difficultly in æther. Submitted to heat, about 5 per cent. of water first passes over; a yellowish-white matter then sublimes and covers the upper part of the retort. This substance is solid, crystallizable, soluble in essential oils, and possesses many of the properties of benzoic acid. Its proportion is not more than 1 per cent. Continuing the distillation, from 35 to 40 parts per cent. of essential oil are obtained, and a thick resin remains in the retort.

The essential oil, when freed from water by prolonged contact with dry chloride of calcium, and distilled a second time, is transparent and nearly colourless, of specific gravity 0.934, boils at  $240^{\circ}$ ; it is soluble in alcohol, æther, naphtha, and the essential and fixed oils. It dissolves caoutchouc, copal, valeria resin, and solid gluten. Potassium and sodium retain their lustre in it, and undergo no change; the taste is acrid, sweetish and heavy; its odour closely resembles that of the essential oil of copaiba.

The residual resin is light brown, easily fusible, of copaibic smell, and faintly acrid taste; absolute alcohol separates it into two parts, *a* and *b*, of which the insoluble part *b* dissolves in spirit of 0.835. Both possess acid properties, and are closely analogous to the copaiba acid resins. Like one of these, the gurjun resin *a* forms a saline compound with magnesia, which dissolves in a mixture of the resin *b* and essential oil.

The close resemblance in the physical and chemical properties of this gurjun and copaiba balsam led Dr. O'Shaughnessy to the institution of an extensive set of experiments on the medicinal effects of the former in the treatment of gonorrhœa. The results, which have been confirmed by trials made by other practitioners, seem perfectly conclusive that in the treatment of gonorrhœa, gleet, and similar affections of the urinary organs, the essential oil of gurjun is nearly equal in efficacy to the South American drug.

The essential oil may be given in 10 to 30 drop doses in mucilage, milk, rice water, or thin gruel, and repeated thrice, or still more frequently, daily. It generally causes a sensation of warmth at the epigastrium, eructations, and sometimes slight purging. It communicates a strong smell of turpentine to the urine, which it increases remarkably in quantity. Some obstinate cases of chronic gonorrhœa and gleet, which had long resisted copaiba and cubebs, have been cured by this remedy in the course of the experiments alluded to.—*Bengal Dispensatory*.

#### *Hemidesmus Indicus, Ununtamul of the Bengalese.*

The root of this plant is long and slender, with few ramifications, covered with rust-coloured very fragrant bark, the odour remaining



after drying, and strongly resembling that of new-mown hay. Stems twining, diffuse or climbing, woody, slender, the thickness of a quill; leaves opposite, short-stalked, of variable shape; on the young shoots issuing from old roots, linear, acute and striated; on the old and superior branches, broad, lance-shaped, ovate, or oval; all are entire, smooth, firm and shining; stipules four-fold, small on the side of each petiole, caducous; racemes axillary, sessile, imbricated with flowers, and then with scales like bracts; flowers small, outside green, inside deep purple; calyx-divisions acute; corolla flat, divisions oblong, pointed, inside rugose; follicles long, slender, spreading.

The roots of this plant have been long employed on the Madras coast as a substitute for sarsaparilla, and have been also used in England, and very highly spoken of. Our trials here have been numerous and satisfactory. Its diuretic operation is very remarkable; 2 oz. infused in a pint of water, and allowed to cool, was the quantity usually employed daily, and by such doses the discharge of urine was generally trebled or quadrupled. It also acted as a diaphoretic and tonic, and so increased the appetite that it became a most popular remedy in our hospital, the patients themselves entreating its administration and continuance. The taste and smell of the infusion are balmy and sweet; we have used it with the most decided benefit in numerous cases of the description in which sarsaparilla is generally given; indeed we consider the activity of this medicine to be much more decided than that of sarsaparilla itself. The ununtamul can be purchased in Calcutta of good quality at from 2 to 4 annas the seer. No good analysis has yet been made of this drug.—Dr. O'Shaughnessy's *Bengal Dispensatory*.

## CHEMICAL PREPARATIONS.

*Purification of Hydrochloric Acid of Commerce.* By M. LEMBERT.

THIS process occasions little expense and requires but little time, so that those manufacturers who may employ it, will be able to send into the market hydrochloric acid chemically pure, and costing scarcely a few farthings more a pound than the ordinary acid. When the acid to be purified contains sulphuric acid, which is the most usual case, I add a little binoxide of manganese, the oxygen of which converts the sulphurous into sulphuric acid. As however it is almost impossible to avoid in so doing the formation of a little chlorine, I add a small quantity of protochloride of iron, or even iron filings, which absorbs the free chlorine\*.

When the acid contains no sulphurous acid, I convey a known quantity into a tubulated retort, adapt a tube in form of an S to the

\* When iron filings are employed they must contain no copper, which would react on the sulphuric acid, and cause it to pass again into the state of sulphurous acid.



tubulure, and to the mouth a Woulf's apparatus, the jars of which contain distilled water and are surrounded by cold water\*.

The apparatus thus arranged, I introduce by means of the tube S a quantity of sulphuric acid of spec. grav. 1.834, twice that of the hydrochloric acid. For this purpose I employ a funnel, drawn out, which is fixed in a firm manner above the tube, and in which rests an inverted flask containing sulphuric acid, which allows of the operation going on alone. The sulphuric acid combines with the water and liberates the gas, which dissolves in the water of the jars. It is important to employ concentrated hydrochloric acid (spec. grav. 1.178); without this precaution the gaseous acid would not be evolved immediately, and it would be less easy to obtain the whole. When the whole of the sulphuric acid has been added, the liquid is heated gradually to boiling; it then contains no more hydrochloric acid. Thus obtained the hydrochloric acid is chemically pure†; and in this operation the expenses are reduced to the concentration of the acid, which, brought from 1.628 to 1.834, may serve again for the same purpose, and even for the less delicate operations in the arts and of the laboratory. It might also be used in many cases just as it is, *i.e.* at 1.628; and lastly, a manufacturer of chemicals who would purify hydrochloric acid by this means, would not have to employ heat in order to obtain the last portions of the gaseous acid, as the weak sulphuric acid containing the hydrochloric acid may be employed in the preparation of this latter.—*Journ. der Pharm.*, March.

#### *Preparation of Bicarbonate of Soda. By M. ARTUS.*

According to the author, the property of charcoal to condense gases may be turned to good account in the preparation of bicarbonate of soda.

2 parts of effloresced carbonate of soda are mixed with 1 part freshly heated pulverized charcoal (from soft wood), the mass moistened with some water, and then brought into a high cylinder, and carbonic acid passed into it. This gas is allowed to act for 24 hours, when the mass is taken out, pulverized, some water added to it, and again returned into the cylinder and carbonic acid passed into it. The same operation is twice repeated, the mass is then taken out of the cylinder and treated with 8 parts of hot water, filtered while hot, and the solution left to crystallize. The bicarbonate of soda formed crystallizes from the solution, while the neutral carbonate remains dissolved in the mother-ley, which is poured off, and

\* I bring no water into the first jar, because at the end of the operation a small quantity of acid water passes over, and even of pure water if the operation is carried too far.

† If the acid to be purified contain arsenic, only the first portions are pure, and even then it is necessary that it should be concentrated at least to 1.178, to avoid the disengagement of any heat on the addition of sulphuric acid. This result is owing to the extreme volatility of the chloride of arsenic.

‡ The quantities of iron and of manganese are so small that they scarcely amount to a millionth of the weight of the sulphuric acid.



may be employed for other purposes. The residuous bicarbonate of soda is then washed with a little cold water, to remove the last traces of any adhering carbonate, and is then dried.

In this manner somewhat more than two-thirds of the quantity of neutral carbonate employed, is obtained of bicarbonate of excellent quality. The charcoal assists greatly in the absorption of the carbonic acid gas, hastening the operation, and at the same time the neutral carbonate of soda becomes of a beautiful white by contact with the charcoal.—*Allgem. Pharmaceutische Zeitschrift* von Artus, No. I.

#### *Preparation of Iodic Acid.*

M. Bourson recommends treating 1 part iodine with 4 parts of the most concentrated nitric acid ( $\text{NO}^5 + \text{HO}$ ) with the assistance of a gentle heat, when the loss of iodine is very small. The acid is formed in small white grains, which, when evaporated with the excess of nitric acid to dryness, and then left at  $59^\circ$  Fahr. exposed to the air, deliquesces. If this mass be then brought to a warmer and drier place, beautiful white rhombic crystals of anhydrous iodic acid are obtained.—*Comptes Rendus*, xiii. p.1111.

#### *Argilla Acetica: Acetate of Alumina.*

Geiger's 'Pharmacopœia Universalis' gives the following formula for the preparation of the acetate of alumina:—

*Rx Aluminæ hydratæ quantum vis. Solve in aceti concentrati quantum satis. Filtra et evapora lenissimo igne ad gelatinæ consistentiam. Serva.*

Thus obtained it forms a clear nearly gelatinous liquid, which changes with difficulty into acicular crystals. It possesses a very styptic, and at the same time a sweetish taste, attracts moisture from the atmosphere, dissolves readily in water, and is easily decomposed by heat. This preparation is recommended in chronic gonorrhœa, hæmoptysis, &c.

#### *Linimentum Causticum Landolphi.*

This liniment, which has been employed with great success in cases of carcinomatous tumours by Landolphi of Naples, consists of 2 grms. *Pasta fratris Comi* (which consists of about 16 parts vermillion and dragon's blood, and 8 parts white arsenic), 2 decigrms. *Morph. acet.*, and 30 grms. *Ceratum album*.—*L'Expérience*, 1843, No. 296.

#### *Lejeune's Balsam for Frost-bites.*

This balsam is prepared as follows:—Dissolve 3 grms. camphor in 16 grms. tincture of benzoë, triturate with 6 grms. iodide of potassium, 32 grms. diacetate of lead, 64 grms. of a mixture of rose water and rectified alcohol of 0.938 spec. grav.; dissolve in another vessel 32 grms. soap in 64 grms. of the same mixture of rose water



and alcohol with the assistance of heat, and add the two solutions immediately together; then add a few drops of any essential oil, and fill into wide-mouthed bottles, which should be well corked and sealed.—*Gaz. des Hôpitaux*, 1843, No. 28.

### *Remedy for Burns.*

The best remedy, according to Payen, is the employment of a liniment of oil of almonds and milk of lime on cotton. Michel states that this liniment is best prepared by shaking together 1 part oil of almonds and 2 parts of saturated lime-water.—*Gaz. des Hôpitaux*, 1843, No. 28.

### *Formic Acid in Oil of Turpentine.*

The occurrence of this acid in the above-mentioned oil was first noticed by M. Weppen and has also been recently observed by M. Laurent. It was deposited in small crystals on the lid of the zinc box in which a manufacturer of oil of turpentine near Bordeaux kept his stores.—*Journ. für Prakt. Chem.*, xxvii. p. 316.

### *Preparation of Crystallized Sulphite of Copper.*

Very beautiful crystals of this salt are obtained, according to M. Bourson, when bisulphite of potash is first prepared by saturating a solution of potash with sulphurous acid, and then mixing this cold with a solution of the sulphate of copper. The small precipitate is separated by filtration and the solution heated, when the acid salt is converted, with considerable evolution of sulphurous acid, into the neutral one, which is then deposited in beautiful dark-red crystals.—*Comptes Rendus*, xiii. p. 1111.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the Means of detecting the Adulterations of Oils in Commerce.* By M. HEIDENREICH.

A SURE method of detecting the adulteration of oils the most generally in use, such as rape-seed oil and that of turnip-seed, has been especially desirable for the last two years, in which, the crops of colza having failed, they have been made up by mixing them with oils of inferior quality and of lower price. The persons who had to purify these oils, were unable to obtain the same results as in the preceding years; and it is also important to know for certain that the oils which are used in the manufacture of cloths, and which should only be non-siccative oils, are entirely free from drying oils, such as linseed oil, cameline oil (from *Camelina sativa*), and others.



M. Heidenreich has endeavoured to solve this question ; and by extending his researches to several other oils, has succeeded in such a manner, that even those less accustomed to chemical operations will be able to discover the presence of a foreign oil in any given oil.

The author passes by the ordinary characters, such as colour, consistency, the point of solidification, and proposes three series of experiments.

1. The first series of experiments relates to the particular smell which each oil diffuses when it is exposed to a gentle heat.

For this purpose it is only requisite to pour a few drops of oil for trial into a small porcelain vessel, and to expose this for some instants to the flame of a spirit-lamp. The smell which is disengaged immediately calls to mind that of the plant or animal from which the oil has been derived ; and this character is sufficiently decisive if a counter trial is made with an oil the purity of which is known. In this way we are able to detect the presence of whale or linseed oil in other oils, with great certainty. In most cases this character serves only as a guide for the finding of other characters, or for confirming less complicated experiments.

2. The second series of experiments relates to the action produced by concentrated sulphuric acid on the oil under examination, and especially to the colour which results from it.

A plate of clear glass is placed on a sheet of white paper, and from 10 to 15 drops of the oil poured on the glass, when if a small drop of concentrated sulphuric acid is then added without agitating it, we soon perceive a different colouring in each oil.

With the rape oil and the oil of turnip seed a greenish-blue ring is gradually formed at a certain distance from the drop of sulphuric acid, whilst some yellowish-brown bands proceed from the centre where the reaction is most lively.

The oil of black mustard also produces a bluish-green colour, but it is necessary to use from 20 to 25 drops of oil.

Whale and cod oil at first exhibit a peculiar centrifugal movement, and at the same time a red colour is produced that becomes more and more intense ; after 10 to 15 minutes the edges become violet, and 2 hours after the entire drop is violet.

The oil of cameline at first acquires a red colour, which afterwards passes into a bright yellow.

Olive oil at first becomes pale yellow, and subsequently yellowish-green.

With the oil of poppies and sweet almonds the colour is canary-yellow at the beginning, and afterwards turns to an opake yellow.

A drop of sulphuric acid immediately determines in linseed oil a red-brown magma, which afterwards becomes brownish-black.

Oleine (oil of tallow) acquires a brown colour.

If the drop of acid which has been added is agitated with a glass rod, the reactions are different. The rape and turnip-seed oils then assume a uniform brown colour without mixture of red ; with from 5 to 6 drops of acid the colour is of an opake brownish-red, and the edges of the mixture become green.



The oil of black mustard produces the same reaction with from 5 to 6 drops of acid, but the colour is still more opake.

Whale and cod oil directly become of a brown-red colour, and then pass from the dark brown to the violet without any mixture of green. If from 5 to 6 drops of acid is added the colour is brighter, and the violet colouring shows itself sooner.

The oil of cameline acquires a grayish-yellow colour, and with from 5 to 6 drops it becomes of a bright orange colour.

The oils of olive, of poppy, and of sweet almonds, become all three of a more or less dirty or grayish-yellow.

Linseed oil produces a brownish and resinous black mass.

Oleine assumes a dirty brown colour.

When a commercial oil is adulterated, it is evidently only with an oil of an inferior price; thus oil of sweet almonds, oil of olives, or cod oil, will never be added to rape or turnip-seed oil, but either purified whale oil, oil of cameline, and sometimes linseed or poppy oil. If the smell has led to a suspicion that whale oil is present in linseed oil, which is the most frequent adulteration, it is only requisite to pour on to a plate of glass from 10 to 15 drops of linseed oil, the purity of which has been ascertained, and as much of whale oil, and by the side of these an equal quantity of oil under examination; a drop of sulphuric acid is then added to each. The colour which results in the two samples shows the adulteration; and the tint which the specimens assume, between the bright red of the whale oil and the bluish-green of the linseed oil, indicates the degree of adulteration. In these experiments it is very important to observe with attention the colours produced at the beginning of the reaction. It is as well also to make one trial without and another with agitation.

We proceed in the same manner in order to discover any other mixed oil where its smell may have caused it to be suspected.

3. The third series of experiments relates to density.

Every oil which is derived from the same plant or the same animal, has at the same temperature a density which hardly varies but in the thousandths.

The density of the oils which have been examined under this point of view, is comprised between 0.900 (oleine), taking water at 59° F. as unit, and 0.961 (castor oil). These two limits correspond to the 66th and 34th degrees of Gay-Lussac's alcoholometer. Consequently, knowing the degree of the alcoholometer which a pure oil indicates, we may ascertain the adulteration of a mixed oil, and we may even judge within certain limits of the degree of adulteration, for the common oils which are most usually employed for this purpose present a great difference of density.

This last method, which is generally employed in commerce, immediately shows the adulteration of an oil, and when the first two are added, the smell and the action of the sulphuric acid, it is impossible to be deceived as to the nature, and indeed hardly as to the quantity of the foreign oil mixed with a given oil.

It will not be out of place to add in conclusion a table of the density of some oils:—



Name of the oil.	Specific weight.	Degrees of Gay-Lussac's alcoholometer.
Oleine (tallow oil) . . . . .	0·9003	66
Oil of turnip-seed . . . . .	0·9128	60 $\frac{3}{4}$
Rape oil . . . . .	0·9136	60 $\frac{1}{5}$
Olive oil . . . . .	0·9176	58 $\frac{2}{5}$
Purified whale oil . . . . .	0·9231	55 $\frac{4}{5}$
Oil of poppies . . . . .	0·9243	55 $\frac{1}{4}$
Oil of <i>Camelina</i> . . . . .	0·9252	54 $\frac{3}{4}$
Linseed oil . . . . .	0·9347	50
Castor oil . . . . .	0·9611	33 $\frac{3}{4}$

*Journ. für Prakt. Chem.*, August 1842.

*Notice of some new Methods of Gilding and Silvering by Immersion.*  
By M. A. LEVOL.

At the present time, when great attention is being directed to the processes of gilding by the moist method, it seemed to me not without interest to publish an account of some new methods for gilding or silvering by immersion, more especially on account of the facility of their execution.

*Gilding on Silver.*—Silver is very easily gilt by means of the neutral protochloride of gold, to which an aqueous solution of sulphocyanide of potassium has been added until the disappearance of the precipitate which at first formed. The liquor thus obtained should possess a slightly acid reaction, and if it has lost it, by too considerable an addition of sulphocyanide, it should be again restored by a few drops of hydrochloric acid. In order to gild, the well-cleansed silver is immersed in this liquor nearly boiling and moderately concentrated, in which state it is kept, adding from time to time hot water to replace that which evaporates. In this manner the inconveniences which would result from too great an accumulation of the hydrochloric acid, the presence of which is nevertheless useful in preventing the formation of an auriferous precipitate, which would otherwise take place at the high temperature employed, were the alkali predominant, are obviated.

*Gilding and Silvering on Copper, Brass, and Bronze.*—A solution of cyanide of gold, and that of cyanide of silver in cyanide of potassium, has been recommended for gilding and silvering under the influence of electric forces. I have found that the same solutions, when at a temperature near their boiling point, may also be employed for gilding and silvering by immersion. Their preparation would be somewhat expensive were it necessary to obtain them chemically pure; but this would not offer the least advantage, and the operation may be simplified and rendered much less expensive by treating either the chloride of gold or the nitrate of silver (both should be neutral) with an excess of cyanide of potassium, so as to obtain the soluble double cyanides\*.

\* As the cyanide of potassium is employed in a state of aqueous solution, and is very dear in the solid state, it is most advantageous to employ the mother-ley



Silver cannot be gilt by this process, but it will be seen above that the sulphocyanide of gold and of potassium gilds this metal extremely well.

The solution of cyanide of copper in cyanide of potassium does not copper silver even in contact with zinc; but it coppers this last metal perfectly, and in a very solid manner.

I may observe, in conclusion, that these processes, so advantageous from their always succeeding and requiring but a few minutes for every preparation, unfortunately do not allow but of the application of a very thin layer of the precipitated metal. This inconvenience is common to all the processes by immersion.—*Journ. de Pharm. et de Chim.*, No. 3, March 1843.

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## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

*April 18th, 1843.*—(Arthur Aikin, Esq., President, in the Chair.)  
The following communications were read:—

“On certain Improvements in the Instrument invented by the late Dr. Wollaston, for ascertaining the Refracting Indices of Bodies,” by John Thomas Cooper, Esq.

After alluding to the advantage of some additional means of identifying organic and inorganic bodies than those generally employed, the author describes the apparatus arranged by Dr. Wollaston for ascertaining the refractive indices of various bodies, and shows that the use of this instrument was necessarily limited in its applications, from the small range of substances that could be submitted to observation. Mr. Cooper then described the improvements he had adopted, from which, by means of prisms of glass, varying in their refractive indices and ranging from 1.516 to 1.816, he was able to investigate any substances whatever. To render these prisms available a modification of the apparatus was indispensable, so that it could be adjusted to the various prisms used, otherwise a distinct instrument would be requisite for each. Full details are then given of the construction of the apparatus and the method of using it, and these were experimentally exhibited to the Society.

“On the Spontaneous Change of Fats,” by W. Beetz. Communicated by W. Francis, Esq.

The author states that his attention had been directed to the examination of a fatty substance found in a deserted iron-mine at Xiffau in the district of Oberberg, which on investigation appeared to be a portion of a miner's candle, in a curiously altered state, which must, from the circumstances under which it was discovered, have remained under ground at least one hundred years.

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from the residue resulting from the calcination in a closed vessel of previously dried ferrocyanide of potassium. Its price then does not exceed a third of the commercial value of the double cyanide, and it might even be obtained at a still less price by the process indicated by Professor Liebig.



The substance, when cleansed from adhering oxide of iron, was white and friable like talc; at 192° Fahr. it melted to a clear liquid; it was soluble in boiling alcohol, and separated in flocks on cooling; warm æther also dissolved it readily; when boiled with caustic potash it underwent saponification, and when the soap so produced was decomposed by hydrochloric acid, a substance separated identical in properties and composition with stearic acid. The original fat indeed possessed all the characters of the stearine of Lecanu; its melting point and composition, as determined by analysis, were very nearly the same as those attributed to stearine by Liebig and Pelouze. On comparing the composition of stearine with that of tallow as a whole, it will be seen that the former substance contains less carbon in proportion to the hydrogen and oxygen than the latter, so that the conversion of tallow into stearine might be imagined to take place by the abstraction of carbon in the shape of carbonic acid and its replacement by the elements of water.

The idea that a change of this sort may in the lapse of time take place, is strengthened by the fact that old tallow is always found to be harder and less oily than that recently prepared; a case is mentioned in which a quantity of tallow having been accidentally kept ten years, an alteration of this nature was distinctly perceptible.

A second fatty substance, apparently of similar origin, taken from a mine near Tarnowitz, was next examined. This specimen, unlike the first, was not entirely soluble in hot alcohol. When boiled with that liquid, and the soluble part separated by a filter, a substance remained which proved to be stearate of lime. The alcoholic solution mixed with water let fall a fatty body having the properties of stearine. The proportions of unaltered stearine and lime-soap were different in different parts of the mass of fat. A portion taken from the outside gave in 100 parts—

Stearine .....	17·98
Stearic acid.....	73·18
Lime .....	7·88
	<hr/>
	99·04

While another piece from the middle of the candle gave in 100 parts—

Stearine .....	71·90
Stearic acid.....	25·25
Lime .....	2·64
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	99·79

So that the change, which is attributed by the author to the slow action of the calcareous water of the mine, must have commenced on the outside and gradually penetrated inwards.

### *Royal Institution.*

April 28, 1843.

Dr. Miller gave a lecture on illustrations of the theory of bleaching. The lecturer detailed the process formerly adopted; the grass



bleaching, the effect of which was due to the oxidizement of the colouring principle. The oxides thus formed were removed by boiling in solutions of alkali, in which they were soluble. The fact of dew holding a very considerable quantity of oxygen in solution rendered this theory very probable, though the lecturer himself considered it was owing to the presence of some compound like the deutoxide of hydrogen, the bleaching effects of which were very decided. A picture, apparently completely destroyed, was smeared on one side with a weak solution of this extraordinary compound; after a few minutes the colours were completely restored. Where the oxides were coloured, as in indigo, this process could have no effect. The new method, that of chlorine bleaching, was supposed by many to be also due to the action of oxygen, the chlorine merely freeing the oxygen by its strong affinity for hydrogen. A striking proof of this was seen in its action on turpentine. A slip of paper moistened with it being introduced into a jar of chlorine gas, produced an explosion. The lecturer however believed that it was owing to the chlorine forming with the colouring matter colourless compounds. Sheele, the discoverer of this gas, had noticed that it powerfully bleached the corks of the bottles in which the solutions were kept, and Berthollet, 15 years afterwards, devised a process for its practical application; but the injurious fumes, and the impossibility of conveying it, prevented its very general application. The recent discovery that the bleaching properties of chlorine were not injured by its combination with alkali had removed these objections. The articles to be bleached were now dipped into a solution of chloride of lime, then into weak acid to disengage the chlorine, and finally washed with a weak alkaline solution to neutralize any excess of acid, and dissolve any colouring matter which might resist the chlorine. The weakest acid, even the carbonic, was sufficient to evolve the chlorine; this the lecturer proved by an experiment. The nature of the compound formed with the chlorine and lime was not clearly understood. He had himself examined many specimens of "bleaching powders," and had never been able to detect more than 5 per cent. of chloride of lime in any. The bleaching power of the fumes of sulphur (sulphurous acid) was shown upon a rose. For many purposes, as in straw-bonnet making, this method was still resorted to; but unlike "chlorine bleaching" the colour could be restored, and its corrosive action prevented its application to linen fabrics. Bleaching by the action of the voltaic battery on common salt evolving chlorine, was also exhibited. The lecturer observed that chlorine had lately been applied in paper manufactories to bleach their fine papers; and this was, he considered, to be much regretted, as several valuable manuscripts had been by this lost, the chlorine acting on the ink. Some writing was introduced into a jar of chlorine, and became in a few minutes effaced. He had found it necessary to test his paper. A metal button-maker at Birmingham had forwarded his spring patterns in some paper thus bleached, and to his surprise had had them returned to him greatly corroded. It was not till this had happened to him several times that he was led



to examine the paper, which was found completely charged with chlorine. The inconvenience in this case was easily obviated by wrapping his patterns in brown paper; but he feared that it would not be easy to find an equally effectual remedy against the very great inconvenience of its bleaching action on ink.—*Illustrated Polytechnic Review*.

## PATENTS.

*Patent granted to John Stephen Woolrich, Birmingham, for Improvements in Coating with Metal the Surface of Articles formed of Metal or Metallic Alloys.*

THE improvements consist in the employment of a magnetic apparatus in combination with metallic solutions.

The solutions are made in the following manner:—Take of the best pearlash of commerce 28 lbs. (avoirdupois), and add to it 30 lbs. (avoirdupois) of water, and boil them in an iron vessel until the pearlash is dissolved; the solution should then be poured into an earthenware or other suitable vessel, and suffered to stand until the liquor becomes cold; it should then be filtered, and 14 lbs. (avoirdupois) of distilled water added; sulphurous acid gas (obtained by any of the known processes) should then be passed into the filtered liquor until it is saturated, taking care not to add sulphurous acid gas in excess; the liquor should be again filtered, and is then termed the solvent.

To make the silvering liquor, dissolve 12 oz. (avoirdupois) of crystallized nitrate of silver in 3 lbs. of distilled water (in a clean earthenware vessel), and add to the solution, by a little at the time, the before-mentioned solvent, so long as a whitish-coloured precipitate is produced (care being taken not to add more of the solvent than is necessary). After the precipitate has subsided, the supernatant liquor is poured off, and the precipitate washed with distilled water; to the precipitate add as much of the before-mentioned solvent as will dissolve it, and afterwards add about one-sixth part more of the solvent, so that the solvent may be in excess; then stir them well together, and let them remain about 24 hours, and then filter the solution, when it will be ready for use. This is the silvering liquor.

To make the gilding liquor dissolve 4 oz. (troy) of fine gold in a mixture of 11 fluid ounces of nitric acid (spec. grav. 1.45), and 13 fluid ounces of muriatic acid (spec. grav. 1.15), and 12 fluid ounces of distilled water; then evaporate the solution and crystallize; the crystals are now dissolved in 1 lb. of distilled water, and the gold precipitated by pure magnesia; the precipitate washed, first, with distilled water acidulated with nitric acid, and afterwards with distilled water alone; then add to the washed precipitate so much of the before-mentioned solvent, or sulphate of potash, as will dissolve the precipitate; about one-fifth more of the solvent is then added, so that the solvent may be in excess; stir them well



together, and let them remain about 24 hours, and then filter the solution, when it will be ready for use. This is the gilding liquor.

To make the coppering liquor, dissolve 7 lbs. (avoirdupois) of the crystals of sulphate of copper in 30 lbs. of distilled water, and add to this solution a solution of carbonate of potash in water until precipitation ceases; then filter and collect the precipitate, and wash it with distilled water, and put it in a clean earthenware vessel; then add to it as much of the before-mentioned solvent as will dissolve the precipitate, and afterwards add one-third more of the solvent, so that the solvent may be in excess; then stir them well together, and let them remain about 24 hours, and then filter the solution, when it will be ready for use. This is the coppering liquor.

The thickness of metallic coating to be deposited on the article intended to be coated, will depend on the time during which the article is submitted to the operation of the magnetic apparatus and solution; a thin coating will be deposited in a few seconds, whilst to obtain a thick coating the article must be submitted to the constant operation of the magnet and solution for several hours. To adjust the magnetic apparatus for operation, it will be requisite to ascertain which of the two copper wires should be connected to the article to be coated. The magnetic apparatus is set in motion, and the ends of both the copper wires inserted into water acidulated with sulphuric acid, when, if the magnetic apparatus is in proper working order, gas will be given off at one end of the wires only, to which wire the article to be coated is connected, and the other wire to a metal plate. When the surface of the article to be coated is not of metal or metallic alloys, a metallic surface is given to it by rubbing plumbago upon it, and the plumbago surface then coated with metal.

The distance at which the poles of the magnet should be placed from the ends of the armature will depend upon the superficies of the article to be coated. The larger the superficies of the article, the nearer must the magnet be placed to the armature; and the smaller the article, the more must the distance be increased, the distance being inversely as the superficies of the article to be coated. If the surface of the article to be coated with metal becomes, while in connexion with the magnetic apparatus, of a brownish or darkish appearance, or if gas be evolved from the surface of the article during the operation, the magnet must be adjusted by a screw, so as to increase the distance between the poles of the magnet and the ends of the armature, until the metal contained in the solution is properly deposited. The author claims as his invention the method of coating with metal the surface of articles formed of metal or metallic alloys, by means of magnetic apparatus in combination with metallic solutions. And also the application of solutions in water of that class of salts known to chemists as the sulphites, for dissolving the preparations of silver, gold and copper, for the purpose of coating with metal the surface of articles formed of metal or metallic alloys.—Sealed Aug. 1, 1842.



*Patent granted to William Edward Newton, of Office for Patents, 66 Chancery Lane, Middlesex, Civil Engineer, for certain Improvements in manufacturing Lime, Cement, Artificial Stone, &c., being a foreign communication.*

This invention consists, first, in the formation, by certain new processes, of a hydraulic lime and cement, which has the property of becoming hard and solid when under water or exposed in damp situations; secondly, in the application of the same principles to the hardening of soft stones, for the purpose of making hard artificial stones; thirdly, in the employment of the same process for hardening wood, and preserving iron from the effects of damp, &c.

The following is the principle upon which the invention is founded, and the methods employed for carrying it into effect. The property which certain sorts of lime possess of being hydraulic, or hardening under water, is caused by a certain combination of the lime with silica, alumina, and sometimes also with oxide of manganese and oxide of iron. The object then of this invention is to facilitate the combination of the lime with those oxides, by means of agents not hitherto employed. Thus in operating by the dry method, as is generally the case, instead of calcining the limestone or lime with sand and clay, the inventor, in order to facilitate the combination of the silica and alumina with the lime, introduces a small quantity of potash or soda, in the state of carbonate, sulphate, or chloride, or of any other salt of these bases, susceptible of decomposition, or becoming a silicate, when such calcination takes place. The salt of potash or soda, the quantity of which varies from 3 to 6 per cent. to the quantity of lime, is employed in the state of solution, so as to penetrate and mix better with the alkaline salt in the chalk or slacked lime. Calcination effects the rest in the ordinary manner.

In order to combine or incorporate more equally, by the dry method, the alumina and the oxides of manganese and of iron with the lime, the sulphates of these bases are first decomposed by the slacked lime, by making a paste with a solution of the sulphates mixed with the lime. This paste, into which the sulphates in question enter in the proportion of from 6 to 10 per cent. of the lime, is then calcined, in order to produce a hydraulic lime. All sorts of lime are made hydraulic, by the humid method, by mixing slacked lime with solutions of alum or sulphates of alumina; but the best method consists in employing a solution of the silicates of potash or of soda, called liquor of flints or soluble glass. A hydraulic cement may also be made, which will serve for the manufacture of architectural ornaments, by making a paste of pulverized chalk and a solution of the silicate of potash or of soda. In working with this plaster it becomes much harder than ordinary plaster.

These same silicates of potash or soda, dissolved in water, will also harden chalk or soft and porous stones, and transform them artificially into hard stones. In order to do this, these soft stones, either rough or cut into their proper forms, must be soaked in a solution of the silicate, either warm or cold, and allowed to remain



there a longer or shorter time according to the degree of hardness which it may be necessary to give them; after which they must be taken out and left exposed to the air. At the end of a few days, stones thus prepared will have acquired a hardness equal to that of marble, and this quality in a little time pervades the whole mass; for if, for the purpose of polishing, the outer coat or surface be removed, the inner one, which at first is not so hard, will harden in its turn by exposure to the air. This takes place as far as the silicate has been able to penetrate. A more superficial hardness is obtained by applying the solution of the silicate of potash or soda by means of a brush. It is in this manner that walls constructed of chalk and mortar may be hardened. Sculpture, and various other objects, which may be made or prepared in chalk, may be hardened, and afterwards serve for decorating buildings and other purposes, without the fear of their becoming injured by frost or damp. Chalk, hardened in this manner, may also be used as a substitute for the stones now employed by lithographers. Plaster models may also be hardened by placing them for some time in a solution of the silicate; but it would be still better to add a portion of the solution to the paste at the time of making the model or using the plaster. The silicate of potash or soda is prepared by fusing one part of white siliceous matter with from  $1\frac{1}{2}$  to 2 parts of potash or soda in the ordinary reverberatory furnaces, or in a glass-maker's or iron crucible. The solutions may be used of any density for plaster, but they should be weaker for chalk. In the last place, the inventor has found that the silicates of potash or soda when dissolved in water decompose spontaneously in the air, and cover the objects to which their solution has been applied with a strong covering or layer; therefore by applying the solution of silicate of potash or of soda to polished iron, and allowing it to dry in the air, the metal is preserved from oxidation. By soaking wood many times in this solution, and allowing it to dry in the open air every time after it has been placed therein, it becomes so much penetrated with silica that it acquires a considerable density and degree of indestructibility.

The solution of the silicate of potash is not the only substance which, by being injected into porous bodies, tends to harden them. A mixture made from a solution of bicarbonate of ammonia and of chloride of magnesium may be successfully employed, or a mixture of the solutions of ammonia and chloride of calcium may be used. In these latter cases, instead of having siliceous injections, they are either magnesian or calcareous. Soft and porous stones may also be considerably hardened, and defended from the action of damp, by first well drying them, and then dipping or steeping them in sulphur, or some natural or artificial resinous or bituminous substance rendered liquid by heat.—Sealed April 3, 1841.



# THE CHEMICAL GAZETTE.

No. XV.—June 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Metallic Acids.* By M. FREMY.

AMONG the most important additions which have been made within the last few years to inorganic chemistry, must undoubtedly be classed the investigations of M. Fremy respecting a new and exceedingly interesting series of compounds,—the metallic acids. The first notice of these bodies, on ferric acid, appeared in the 'Comptes Rendus' for January 1841, of which a translation was given in the 'London and Edinburgh Philosophical Magazine' for May 1841; since this period three other memoirs have appeared, the substance of which is given in the following report drawn up by Dr. Will, and inserted in the December Number of Liebig's *Annalen*:—

Fremy divides the metallic acids into two classes—such as originate by direct combination of the metal with oxygen, and dissolve in alkali in the cold as stannic acid; to the second belong those where a metallic oxide is submitted to the contemporaneous influence of an alkali and of an oxidizing body; of these ferric acid affords a good example. Those belonging to the first class are generally more constant, and form crystallizable salts; the others are very easily decomposed, giving off oxygen.

The most easy method of preparing ferrate of potash in the dry way is to throw 10 parts of dried and pulverized nitre on to 5 parts of red-hot iron filings; a reddish mass is formed, which contains much ferrate of potash\*. When chlorine is passed into concentrated solution of potash in which hydrate of the peroxide of iron is suspended, neither a chlorate nor a chlorite salt is formed, but, according to Fremy, a peculiar compound, which he calls chlorated potash, and which is decomposed at a gentle heat into chloride of potassium, oxygen and potash. This compound gives rise to the conversion of the hydrate of the peroxide into ferrate of potash, and under its influence is also formed from the oxide of copper another new acid,—cupric acid.

Ferric acid,  $\text{FeO}^3$ , has an analogous composition to the chromic, manganic and sulphuric acids; its salts are easily decomposed by heat, presence of organic substances, finely divided bodies, &c., just like

\* See M. Wackenroder's observations on the preparation of ferric acid at p. 337 of this Journal.—ED.



the peroxide of hydrogen. They have the same composition whether prepared in the moist or in the dry way ; but in the latter case they frequently contain nitrites, which at the moment of the decomposition of the ferric acid are converted by the absorption of oxygen into nitrates. There moreover exists an acid containing more oxygen than the ferric acid, and also an oxide corresponding to the peroxide of manganese and bisulphuret of iron. By the action of peroxide of barium on sesquioxide of iron a combination of iron and oxygen is formed, which appears to be intermediate between the latter oxide and ferric acid.

The highest degree of oxidation of tin behaves under all circumstances as an acid. When perchloride of tin is treated with an insoluble carbonate, an acid is thrown down, which even reddens litmus paper. Carbonate of potash precipitates from the perchloride of tin insoluble stannate of potash. The combinations of stannic acid with other acids must be considered as double acids, and not as salts of the peroxide of tin\*.

Freymy has applied distinct names to the two modifications of stannic acid ; to that formed by means of nitric acid he gives the name of stannic acid, while that which is obtained from the perchloride of tin is called metastannic acid. They differ only in the amount of water, and the metastannic acid may be converted by drying into the former. The neutral stannates are composed according to the formula  $\text{Sn}^3\text{O}^6 + \text{MO}$  ; the metastannates have the formula  $\text{Sn}^3\text{O}^6 + 3\text{MO}$ . The former therefore is a monobasic, the latter a tribasic acid. The fact observed by Freymy, that the stannates on being heated with excess of alkali are immediately converted into metastannates, is explained from this composition. The stannates are obtained by dissolving the stannic acid, prepared by heating tin with nitric acid, in alkalies at the ordinary temperature. The metastannates are either formed by dissolving the metastannic acid (precipitated from perchloride of tin with an insoluble carbonate) in alkalies, or by igniting stannic acid with excess of alkali in a silver crucible. The metastannates of potash and soda crystallize easily and very beautifully. When stannic acid is treated in the cold with protochloride of tin, the acid immediately becomes of an orange-yellow ; hydrochloric acid alone remains in the solution, and a new oxide of tin is formed, which must be considered as the stannate of the protoxide of tin, analogous to the molybdate of the oxide of molybdenum, tungstate of the oxide of tungsten, and chromate of the oxide of chromium. Stannic acid is so easily coloured yellow by the protochloride of tin that in many cases it may be used as a test for ascertaining the presence of the former.

Freymy supposes that a metallic acid only then exhibits electro-negative properties when combined with water. It loses the character of an acid when it is anhydrous, and its capacity of saturation increases with the amount of water.

According to Freymy no definite compound of alumina with alkali

\* See M. Moberg's article on some stannates at p. 342.—ED.



lies has yet been analysed\*. He prepared the crystallized compound, which contained 1 equiv. potash, 1 equiv. alumina, 2 equiv. water: in the neutral aluminates the oxygen of the acid is therefore to that of the base as 3 to 1.

The combinations of the oxide of zinc with alkalies are in general deliquescent and not crystalline. If however a solution of oxide of zinc in potash is treated with a little alcohol, a crystallized salt is obtained in long needles, which according to Fremy is the bizincate of potash. It is immediately decomposed by water into anhydrous oxide of zinc and potash.

According to some chemists a solution of protoxide of tin in an alkali deposits on evaporation crystals of metallic tin, and according to others of anhydrous protoxide. The experiments of Fremy show, that when a solution of protoxide of tin in a small quantity of potash is concentrated under the air-pump, a moment occurs when the alkali seizes the hydrate-water of the protoxide, which thus loses its solubility in the alkali, and is deposited in the anhydrous state; but when, on the contrary, hydrate of the protoxide of tin is dissolved in an excess of alkali, and the liquid quickly evaporated, the protoxide is decomposed into stannic acid, which remains in combination with the alkali, and into tin, which is precipitated. The decomposition therefore differs according to the proportion of the alkali.

When hydrate of the protoxide of tin is heated to boiling with a quantity of potash insufficient to dissolve it, the perfectly amorphous precipitate is suddenly changed into a number of very hard, shining, black crystals, which consist of anhydrous protoxide of tin. This protoxide differs in its colour and crystallization from that prepared according to Gay-Lussac's method, in which protochloride of tin is heated to boiling with excess of ammonia; both may however be easily converted into the same state. When black protoxide, prepared by means of potash, is heated in a tube to about  $392^{\circ}$ , it undergoes a kind of decrepitation, the crystals spring violently, increase in volume, and are converted into the olive protoxide, which is similar in every respect to that prepared by Gay-Lussac's method. Solutions of salts have likewise the power of depriving the protoxide of tin of its hydrate-water. When the hydrate of the protoxide of tin is boiled for some seconds in concentrated solutions of chloride of potassium or chloride of ammonium, it parts with its water of hydration; when a very dilute solution of sal-ammoniac, in which a small quantity of the hydrate of the protoxide of tin is suspended, is evaporated, the hydrate is converted, at the moment when the salt separates from the solution, into a very beautiful scarlet-red powder. This body is also protoxide of tin in a new isomeric state. It may very easily be converted into the olive protoxide, for when rubbed with a hard body it immediately assumes the brown colour of the anhydrous protoxide of tin. According to this, then, prot-

\* This is however a mistake: several years ago M. Schaffgotsch analysed an aluminate of soda,  $\text{Al}^2\text{O}^3\text{NaO}$ .—See *Pogg. Ann.*, vol. xliii. p. 117.



oxide of tin may be prepared in three different states—of a black, olive-green, and red colour.

When the hydrated oxide of bismuth is heated to boiling in a solution of alkali, the previously white precipitate is suddenly converted into numerous small yellow and shining needles of anhydrous oxide.

Jaquelain has shown that oxide of bismuth when heated with an alkali becomes more highly oxidized, and enters into combination with the latter, but he did not isolate the new oxide. According to Fremy, when oxide of bismuth is heated with soda it absorbs oxygen, and a bismuthate of soda is obtained. When this salt is boiled with an excess of soda, the metallic oxide parts with its excess of water, and separates from the alkali as in the preceding experiments. The oxide thus prepared is of a puce colour, like the peroxide of lead; it may be washed with concentrated nitric acid without decomposition; it has the formula  $\text{Bi}^2 \text{O}^4$ . The other oxide of bismuth is  $\text{Bi}^2 \text{O}^3$ , which agrees with the experiments of Jaquelain, and the more recent researches of Regnault on the specific heat of bismuth and its compounds\*.

Oxide of lead dissolves in alkalies, and forms with some bases crystalline compounds; the hydrate of the oxide of lead however parts as easily with its hydrate-water under the influence of alkalies, as the oxides of zinc and of bismuth. When the hydrated oxide of lead is heated to boiling with a quantity of solution of caustic potash not sufficient to dissolve it, it is converted into an anhydrous, perfectly crystalline oxide. This is the same oxide as was obtained by Payen on treating acetate of lead with ammonia. Its colour is changed at a high temperature, and also by friction.

The solutions of the oxide of lead in alkalies deposit on evaporation crystals of anhydrous oxide, which differ from the preceding by the ease with which they dissolve in very dilute alkaline solutions.

The so-called puce oxide of lead (the peroxide), which hitherto has been regarded as being possessed of indifferent properties, is, according to Fremy, a true acid, which can combine with all bases to form definite and frequently crystallizable salts, which are composed according to the formula  $\text{PbO}^2 \text{MO}$ . For this reason Fremy proposes for the peroxide of lead the name of plombic acid; the combinations of the oxide of lead,  $\text{PbO}$ , with metallic oxides he calls plumbites, those of the peroxide of lead with bases plumbates.

The plumbates can only be prepared in the dry way. The potash and soda compounds are obtained by heating the peroxide of lead (plombic acid) with an excess of these alkalies in a silver crucible. The mass is treated with water, when the liquid on evaporation deposits very distinct crystals of the plumbate of the alkali. These salts may also be prepared by heating oxide of lead with the alkali exposed to the atmosphere. The plumbates of potash and of soda may be obtained well crystallized from an alkaline solution: they are decomposed by pure water. When therefore the solution of a plom-

\* See also M. Werther's observations on this subject at p. 204.

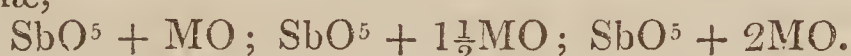


bate is diluted with much water, it soon becomes of a dark-red colour and deposits plombic acid. Acids also precipitate the plombic acid from solutions of the plombates. Minium is a salt of plombic acid, for all the plombates may be prepared by heating a mixture of oxide of lead with a metallic oxide exposed to the air: it is the plombate of lead.

When a metal is capable of forming at the same time an oxide and an acid, there almost always results a combination of the acid with the oxide, as for instance the chromate of the oxide of chromium, the tungstate of the oxide of tungstenum, and the stannate of the protoxide of tin, &c.

Berzelius states that antimonie acid forms a salt with potash, consisting of equal atoms of acid and of base, which he considers to be the neutral salt. Fremy found moreover that antimonie acid forms with bases another series of compounds, which contain  $1\frac{1}{2}$  equivalent of base to 1 of acid. These compounds are obtained by heating the antimonate salts of the first series with an excess of the base.

A third class of antimonates consists of 2 equivalents of base to 1 of acid. The three series of antimonates may be represented by the formulæ,



When a solution of a soda salt is added to antimonate of potash, prepared by melting antimonie acid with excess of potash, an insoluble crystalline precipitate of antimonate of soda is obtained. In this manner the presence of  $\frac{1}{350}$ th of a soda salt can be detected by means of antimonate of potash. The precipitate is only formed after shaking; it is somewhat soluble in a large excess of carbonate of potash. Fremy believes that the antimonate of potash may be employed in many cases for the quantitative determination of soda, in which case strong alkaline liquids should naturally be avoided\*.

#### *Action of Nitric Acid on Carbonate of Lime. By M. BARRESWIL.*

It is a generally admitted fact that marble is not attacked by highly concentrated nitric acid. Wishing to ascertain whether this anomaly was owing to an action similar to that which this acid exercises towards certain metals, I kept a piece of marble in concentrated nitric acid, and I found that it was not visibly attacked. I then removed it from the acid, washed, dried and pulverized it, and introduced the powder into some fresh acid; this was strongly attacked, but did not entirely dissolve. I then added a little water to the acid; the reaction was again manifest, then ceased after some time, to begin again on the addition of a fresh quantity of water. From these facts we may conclude that marble is attacked by concentrated nitric acid with an energy proportionate to its surface; but it becomes covered by a varnish of nitrate of lime insoluble in concentrated nitric acid, which prevents all further action. This nitrate of lime concentrates the nitric acid in which it is formed, and

\* See p. 266.



restores it to the maximum state of concentration. A direct experiment was quite conclusive: the dried nitrate of lime, placed in contact with moderately strong nitric acid, concentrated it so as to make it fume.—*Journ. de Pharm.* for April 1843.

*On Kinovic Acid.* By M. SCHNEIDERMANN.

This acid is the same as kinova bitter, and is evidently identical with Pelletier and Caventou's kinovic acid, although they have not noticed the bitter taste, but it differs decidedly from smilacine\*. The kinovic acid employed for examination was extracted from the bark of *Cinchona nova*, by boiling with milk of lime and precipitating the filtered extract with hydrochloric acid. For further purification it was dissolved repeatedly in ammonia, the solution treated each time with animal charcoal, and then thrown down with muriatic acid, upon which it was dissolved in alcohol, and precipitated from this solution by the addition of water, and this latter operation repeated until it appeared perfectly white.

The acid thus prepared forms when dry gum-like pieces, and after pulverization a dazzling white powder of intense bitter taste; it is almost wholly insoluble in water, but dissolves readily in alcohol and æther when gently heated, and is thrown down from these solutions by water in voluminous white flakes. Buchner's statement, that it might be obtained crystallized from alcohol and from hydrochloric acid, was not confirmed; it always remained, on the evaporation of the alcoholic or æthereal solution at a gentle heat or in vacuum, as a white mass full of fissures, but not a trace of crystallization could be detected even with the assistance of the microscope; nor could it be obtained in a crystalline state from hydrochloric acid, in which indeed it is scarcely more soluble than in pure water.

Dried in vacuum at the ordinary temperature, the kinovic acid still suffered, on being subsequently heated, a slight loss in weight, which however appeared to be solely owing to hygroscopic moisture, which the acid retains very firmly. When dried at 212° Fahr. it then lost nothing in weight on the temperature being raised; it therefore contains no chemically combined water, which would have been expelled by heat. The analysis made with oxide of copper of the kinovic acid, dried with the assistance of heat, afforded the following results:—

	I.	II.	III.	IV.	Atoms.	Calculated.
Carbon . . . . .	67.62	67.62	67.60	67.89	38	67.71
Hydrogen . . . . .	9.12	8.95	8.94	8.89	30	8.79
Oxygen . . . . .	23.26	23.43	23.46	23.22	10	23.50

These analyses agree very nearly with those of Petersen.

The analyses just mentioned, made with an acid of two different preparations, afforded a constant composition, and appears to show with certainty that it is a simple unmixed substance. With regard to its supposed identity with smilacine, this is proved by the present examination to be entirely unfounded.

\* See p. 15 for a notice on this subject.—ED.



To determine the atomic weight of kinovic acid, M. Schnedermann endeavoured to prepare some salts of definite composition. He found it to belong to the class of very weak acids, that it very readily formed combinations with bases, but that these are easily decomposed and are difficult to obtain of constant composition. Alkalies, and the hydrates of the alkaline earths, dissolve in the acid with ease, and most of the metallic salts produce in these solutions precipitates of kinovates. The analysis of some of the salts thus prepared afforded however no results which agreed with each other. Finally, the copper salt was chosen for the purpose of determining the atomic weight; it was obtained by mixing the alcoholic solution of the kinovic acid with an alcoholic solution of a neutral acetate of the oxide of copper as a light blue precipitate. For the elementary analysis it wasedulcorated with alcohol, dried at  $212^{\circ}$ , after which it suffered no loss on being exposed to a higher temperature. It was found to consist in 100 parts of—

	I.	II.	Atoms.	Calculated.
Carbon .....	61.83	61.95	38	62.12
Hydrogen .....	8.03	7.97	58	7.80
Oxygen .....	19.37	19.31	9	19.40
Oxide of copper..			1	10.68

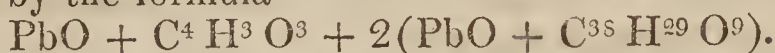
The author likewise examined the combination with lead, which separates on mixing the alcoholic solution of kinovic acid with a spirituous solution of sugar of lead. In this case a white precipitate is formed in small quantity at the commencement, which appears to be kinovate of lead; but after a short time another precipitate is formed, of a very gelatinous nature, the quantity of which is far greater, so much so, indeed, that on its separation, the liquid, if not too dilute, becomes entirely converted into a solid mass. This precipitate is a combination of kinovate and acetate of lead. It was impossible to obtain it in a sufficient quantity for analysis free from the first precipitate, for on filtering the mixed fluid as quickly as possible, the greater portion nevertheless separated on the filter, and the filtered liquid contained very little of it. But as the quantity of the first precipitate was comparatively small, especially when an excess of solution of sugar of lead had been added at the commencement, two analyses were made of the mixed double compound. It wasedulcorated with alcohol, and dried at  $212^{\circ}$ , and afforded—

	I.	II.	Atoms.	Calculated.
Carbon .....	47.14	46.40	80	46.28
Hydrogen .....	6.09	5.99	122	5.81
Oxygen .....	16.08	16.80	21	16.01
Oxide of lead....	30.69	30.81	3	31.90

These analyses differ somewhat from each other and from the calculated composition, which however is easily explained from the analysed substance containing some kinovate of lead mixed with it, which rendered the amount of lead less, and increased that of the carbon.



There can be no doubt that its composition in the pure state is represented by the formula



The salts which kinovic acid forms with the alkalies and the alkaline earths are all amorphous, are easily soluble in water and alcohol, and possess a very bitter taste and a slight alkaline reaction. The kinovic acid is separated by acids from their aqueous solutions in the form of a white flocculent precipitate, and they are entirely decomposed even by carbonic acid. With respect to the magnesia salt, which is obtained on boiling the acid with magnesia and water, filtration and evaporation, it may be observed that it is probably from its appearance that Pelletier and Caventou compared this acid with a fat acid, as they chiefly directed their attention to this salt; and on the evaporation of a large quantity of its aqueous solution a membranous mass separates on the surface, which indeed has a remarkably fatty appearance.—*Journ. für Prakt. Chem.*, xxviii. p. 327–333.

*On the Products resulting from the Decomposition of Quinic Acid by Heat.*

M. Wöhler has drawn attention to the following very interesting compounds resulting from the distillation of quinic acid, in the examination of which he is at present engaged.

A. The volatile product which is obtained by the decomposition of quinic acid by heat, formerly called pyroquinic acid, contains,—1, benzoic acid; 2, a liquid volatile acid, very similar to salicylic acid (spiroic); 3, a neutral crystalline body.

B. This latter body forms colourless hexagonal prisms. It is soluble in water, alcohol and æther. It is characterized by the remarkable change which it undergoes in contact with oxidizing agents. If to its solution some perchloride of iron is added, it becomes of a blackish-red colour, and in a few moments it is filled with very brilliant prisms of a golden-green colour. Chlorine, nitric acid, nitrate of silver and the chromate of potash behave in the same manner. Nitrate of silver at the same time deposits metallic silver, and the chromate, hydrated oxide of chromium.

C. The green body thus formed is one of the most beautiful organic compounds. Although non-azotized it has the greatest resemblance to murexide; its metallic lustre however is still more perfect and more beautiful; it is hardly possible to distinguish it from that of the cantharides or the feathers of the humming-bird. The act of its formation is an exceedingly brilliant phenomenon of crystallization, for even in small quantities it is easy to obtain crystals of several lines in length. It is insoluble in cold water; alcohol dissolves it without change. The solution is red, and on evaporation deposits metallic green crystals.

D. Exposed to a gentle heat, even in water, this body decomposes into a new crystalline body without colour, and into *quinoyl*, a volatile yellow crystallized substance, discovered six years ago by



M. Woskresensky, while decomposing quinic acid with binoxide of manganese and sulphuric acid.

E. The green body, treated with sulphurous acid, dissolves and changes into B, or the crystalline colourless body primarily contained in the products of the distillation of quinic acid.

F. These two crystalline substances are immediately produced from quinoyl on exposing it to the influence of reducing agents, for instance to the influence of hydrogen in the moment of its separation. If sulphurous acid, or some protochloride of tin, is carefully poured into a solution of quinoyl in water, in a few moments it is filled with magnificent prisms of a golden-green colour. This is indeed the simplest method of procuring this body. In the same manner it is formed in a solution of quinoyl mixed with hydrochloric acid, by the insertion of some metallic zinc, and passing a voltaic current through it.

G. By mixing the solution of quinoyl with an excess of protochloride of tin or of sulphurous acid, the influence exceeds the formation of the green body, and we obtain the colourless body B. The most advantageous method of preparing this latter, is to introduce some sulphurous acid gas into the solution of quinoyl, and to evaporate it till it begins to crystallize. The sulphuric acid formed remains in the mother ley without affecting the crystals.

H. The most remarkable mode of formation of the green crystals is by the reciprocal action of the colourless body B and of the quinoyl. On mixing the solutions of these two substances they immediately combine and produce green crystals. Alloxantine acts in a similar manner; with quinoyl it produces the green body and alloxane.

I. On passing a current of sulphuretted hydrogen through a solution of quinoyl, it becomes red, and soon turbid, and deposits an amorphous body of a very dark olive-green colour in great quantity. It is very easily dissolved by alcohol. The solution is of a dark red colour; it is not crystalline. It is an organic combination, which contains nearly 20 per cent. of sulphur.

K. The colourless liquid filtered from this body leaves after evaporation a colourless crystalline substance, which is a second organic combination containing sulphur. It is characterized by the change which it undergoes under the influence of the same oxidizing agents, which change the body B into green crystals. By mixing its solution, for example with the perchloride of iron or with a solution of chlorine, a brown precipitate is formed. This is a third sulphur compound. It is soluble in alcohol, from which it is deposited in a crystalline state.

L. On passing a current of telluretted hydrogen through a solution of quinoyl, a grayish-black body is deposited; this is pure tellurium; but the quinoyl has disappeared. On evaporating the liquid, the crystallized colourless body B is obtained.

Quinoyl. . . . .  $C^{15} H^5 O^5$  (Woskresensky).

The golden green body . . . . .  $C^{15} H^5 O^5 + 2H$ .

The body B in hexagon prisms. .  $C^{15} H^5 O^5 + 4H$ .

The olive-greensulphur compound  $C^{15} H^5 O^5 + 2HS$ .



*Observations on the Wax of Bees.* By M. LEWY.

M. Liebig, while admitting the existence of fatty matters in the food of herbivorous animals, observes that the properties of these bodies are related closely to those of wax, but refuses to admit *that a fatty substance saponifiable like wax* can, under the influence of the vital forces, be converted into a fatty body similar in nature to those which are deposited in the animal tissues, such as stearic and margaric acids. The following results will show that the distance which separates wax from the fatty bodies of animal origin is not so great as the illustrious chemist of Giessen is inclined to admit.

The bees-wax which I have examined was perfectly pure, and melted at 147° Fahr. On analysis it furnished the following results:—

Carbon .....	79.99	80.48	80.20
Hydrogen .....	13.36	13.36	13.44
Oxygen .....	6.65	6.16	6.36

These numbers agree well with those recently obtained by M. Ettling, on submitting his analyses to the correction required by the new atomic weight of carbon.

On treating this wax with a concentrated and boiling solution of potash, it is *entirely* converted into soluble soaps. Saponification effected with oxide of lead showed that no glycerine was formed during the reaction.

I have confirmed the opinion enounced by several chemists, that bees-wax purified with boiling water and cold alcohol contains two distinct principles, differing considerably by their solubility in hot alcohol. One of these principles has been termed *cerine*; it dissolves in about 16 parts of boiling alcohol. The other, *myricine*, is nearly insoluble in boiling alcohol and even in æther. Cerine afforded on analysis—

Carbon .....	80.53	80.23
Hydrogen .....	13.61	13.30
Oxygen .....	5.86	6.47

Its melting point is 145° Fahr.; it has a decided acid reaction, dissolves in alcohol, from which it separates on cooling in very minute acicular crystals.

Myricine furnished the following numbers:—

Carbon .....	80.17	80.28
Hydrogen .....	13.32	13.34
Oxygen .....	6.51	6.38

Melted at a gentle heat, it solidifies at 152° Fahr.

From the preceding analyses it results that the two substances which exist already formed in the wax are isomeric with each other, and also with the wax itself. On calculating the preceding numbers according to the formula  $C^{68} H^{34} O^4$ \*, we have—

$C^{68}$ .....	51.00	80.31
$H^{34}$ .....	8.50	13.38
$O^4$ .....	4.00	6.40

\*  $C = 75, H = 12.5.$



Cerine, when heated with potash-lime (*Chaux potassée*) in a metallic bath, disengages pure hydrogen, and an acid is formed, which remains in combination with the alkali. The acid extracted from the soap, purified with the precautions employed by MM. Dumas and Stas in the preparation of ethalic acid, was perfectly white and crystalline; its melting point was  $158^{\circ}$  Fahr., which is exactly that of stearic acid. The analysis of this acid afforded—

Carbon .....	76.73	77.03	76.71
Hydrogen .....	12.86	12.81	12.74
Oxygen .....	10.41	10.16	10.55

These numbers agree with the formula  $C^{68} H^{34} O^7$ , which gives—

$C^{68}$ .....	51.00	76.69
$H^{34}$ .....	8.50	12.78
$O^7$ .....	7.00	10.52

which is precisely the formula adopted by Liebig and Redtenbacher for stearic acid. It appears therefore to be proved that under oxidizing agencies wax or cerine may be converted into stearic acid identical with that which may be extracted from mutton suet.

The following equation will exhibit the mode of reaction in a very simple manner:—



From the above experiments it may therefore be concluded,—1, that wax, contrary to the opinion generally received, is soluble in concentrated boiling potash; 2, that under oxidizing agencies it is converted into stearic acid; 3, that by a further oxidation this in its turn is converted into margaric acid; and 4, that consequently between the principles contained in the wax and those of the usual fatty bodies, there is no other difference than that which results from a more or less advanced oxidation.—*Comptes Rendus*, April 3, 1843.

We are obliged to postpone for our next Number M. Gerhardt's observations on the products resulting from the oxidation of bees-wax by means of nitric acid.—ED.

#### *On Olivile. By M. SOBRERO.*

Olivile, which was discovered and analysed by M. Pelletier in 1816, is very easily obtained by first submitting the pulverized resin of the olive to treatment with æther; then dissolving the residue in boiling alcohol, and leaving the filtered solution to crystallize on cooling. It is easily freed from the resinous matter with which it is impurified, by throwing it on a filter and washing it with cold alcohol, which dissolves but very little of it, and leaves it perfectly white. By redissolving and crystallizing it anew, it is obtained in small brilliant radiated needles.

Olivile dissolves readily in alcohol and in water, and crystallizes from both mediums. It also dissolves in æther, but in very small quantity, and in volatile and fixed oils.

Olivile, like lithofellinic acid, silvic acid, and other substances,



exhibits the phenomenon of a different melting point in its crystalline and amorphous state\*. When in crystals its point of fusion is at  $248^{\circ}$  Fahr.; on melting it acquires a resinous aspect, and neither increases nor decreases in weight; it does not lose its transparency on cooling; it fractures, without however again assuming its crystalline structure; in this state its melting point is  $158^{\circ}$ . By dissolving it in alcohol, and crystallizing it afresh, its melting point again becomes  $248^{\circ}$  Fahr.

Olivile may be obtained anhydrous, monohydrated or bihydrated. Anhydrous olivile is obtained by causing it to crystallize in anhydrous alcohol, or by melting crystallized olivile in water. Its composition leads to the formula  $C^{28} H^9 O^{10}$ .

Olivile, crystallized in water, and dried in the vacuum of the air-pump over sulphuric acid until it loses no more in weight, retains 1 equivalent of water, of which it can only be deprived by fusion. Its composition is then represented by the formula  $C^{28} H^9 O^{10} + HO$ .

Olivile, crystallized from water, and pressed between bibulous paper until pulverulent and dry to the touch, retains 2 equivalents of water, and it is then represented by  $C^{28} H^9 O^{10} + 2 HO$ .

Olivile combines with oxide of lead, and affords a salt, the composition of which represents 1 equivalent of anhydrous olivile and 2 equivalents of oxide of lead,  $C^{28} H^9 O^{10} + 2PbO$ .

The composition assigned by M. Pelletier to olivile does not agree with any of those which have just been indicated. This chemist has given the formula in atoms for this body,  $C^{24} H^9 O^4$ , and the composition in 100 parts: carbon 63.84, hydrogen 8.06, and oxygen 28.10. Neither of the three states of olivile which I have described present such a composition.—*Journ. de Pharm.* for April 1843.

#### *On Lithofellinic Acid.*

Since our former notice of this subject (p. 85), MM. Malaguti and Sarzeau have likewise found lithofellinic acid in the examination of an oriental bezoar, that consisted almost entirely of it. By the action of nitric acid an acid is formed from it, which contains 8 atoms hydrogen less, and 6 atoms oxygen and 2 atoms hyponitric acid more than the lithofellinic acid. When it is submitted to dry distillation, pyrolithofellinic acid is obtained, which contains 2 atoms water less than the acid whence it is derived. We have accordingly the following formulæ:—

Lithofellinic acid.....  $C^{40} H^{36} O^8$ .

Lithazofellinic acid.....  $C^{40} H^{28} O^{14} + 2(NO^4)$ .

Pyrolithofellinic acid .....  $C^{40} H^{34} O^6$ .

No analytical details have as yet been published.—*Comptes Rendus*, xv. p. 518.

#### *On Aventurine. By M. BARRESWIL.*

In a former Number of this Journal (p. 244) we inserted a notice by Prof. Wöhler, in which it was asserted that the glittering particles

\* See Prof. Wöhler's remarks on this subject at p. 116.



contained in aventurine glass consist of minute crystals of metallic copper. M. Barreswil states that it is very easy to prove that this assertion is quite correct, for when aventurine is reduced to a fine powder in an agate mortar, and this powder is then submitted to trituration and suspension in the mortar, the greater part of the glass is separated, and the spangles remain at the bottom. These isolated glittering particles present all the properties of pure copper: thus they are flattened by friction without being reduced to powder, and dissolve in mercury, &c.—*Journ. de Pharm.*, April.

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## ANALYTICAL CHEMISTRY.

### *Method of separating the Deutoxide of Cerium from the Deutoxide of Didymium.* By M. L. BUONAPARTE.

THE author states that he had been occupied for some time in the chemical investigation of several metallic valerianates, and especially of those of cerium, when he became aware of M. Mosander's discovery of didymium. He had succeeded in finding in a concentrated solution of valerianic acid a most excellent means of separating the deutoxide of cerium in a pure state from the deutoxide of didymium. In fact valerianic acid enjoys a singular and unexpected affinity for the deutoxide of cerium, for it occasions an abundant precipitate in a neutral and concentrated solution of the mixed nitrates of the deutoxide of didymium and cerium. The yellowish-white precipitate consists entirely of the valerianate of the deutoxide of cerium, and it only requires to be well washed and to be calcined at a strong red heat in contact with the air to obtain the pure deutoxide of this metal. This oxide is of a very pale yellow colour, like that described by M. Mosander, who however expressly states that he had hitherto not been able to find any absolute means of separation for the oxides of cerium, lanthanum and didymium.

The oxide of didymium remains dissolved in the acid liquid, from which the valerianate of the deutoxide of cerium has been precipitated. A portion of the cerium however remains mixed with the didymium, for the valerianates of these two metals are slightly soluble in water, and still more so in acid liquids, especially that of didymium, which is far more soluble in weak acids than that of cerium. It is however possible, by the means of valerianic acid, to obtain the oxide of didymium in a state of purity, although with much more difficulty than that of cerium. The author promises further details on the separation, preparation, and the properties of these two oxides in the pure state, as obtained by means of valerianic acid, in a future memoir.

It is stated, in conclusion, that to obtain the pure valerianate of the deutoxide of cerium from the mixed nitrate of the deutoxide of cerium and of didymium, it is necessary to throw down this salt by an aqueous and concentrated solution of valerianic acid; if a soluble valerianate were employed, the didymium, which is very slightly



soluble in the state of valerianate in neutral solutions, would likewise be precipitated. The easy preparation of the deutoxide of cerium in a pure state is owing therefore to the great solubility of the valerianate of didymium in acid liquids, and to the less solubility of that of the deutoxide of cerium under similar circumstances.—*Comptes Rendus*, May 8.

*New Method of determining several Metals, more especially of Mercury, in the Moist Way.*

Mialhe employs, for the determination of those metals which are entirely precipitated by alkaline sulphurets, a process in imitation of Gay-Lussac's method of determining silver: it is based on the above property of several metals being thrown down by sulphuret of sodium, and on the other hand on the sulphuret of sodium being easily decomposed by an alcoholic solution of iodine. A measured solution of pure crystallized sulphuret of sodium in boiled distilled water is added in drops to the solution of the metallic salt, until a precipitate is no longer formed, care being taken that the excess added be as small as possible; it is then filtered, the precipitate washed, the liquids which have passed through mixed with some starch-paste, and a measured alcoholic solution of iodine added by degrees, until in consequence of the iodide of amyllum formed the liquid has assumed a blue colour. If now it has been previously ascertained in the same manner how much of the solution of the sulphuret of sodium was requisite to precipitate a fixed quantity of oxide of mercury, oxide of lead, sesquioxide of iron, &c., and it is also known the quantity of solution of sulphuret of sodium which corresponds to a certain quantity of the solution of iodine (Mialhe prepares the solutions in such a manner, that 20 chlorometric degrees of the one are exactly decomposed by the same quantity of the other), it is evident that the amount of metallic oxide actually present may be ascertained by a simple calculation, when the amount of solution of sulphuret of sodium added in excess and determined by the addition of the solution of iodine is subtracted from that actually used. To avoid the evil which several metallic sulphurets present, that of being very slowly deposited, M. Mialhe varies the solvents of the metallic salts according to circumstances; thus he finds that alkaline chlorides favour the precipitation of corrosive sublimate, nitre that of salts of silver and of lead.—*Journ. de Pharm. et de Chim.*, i. p. 293.

*On the Determination of very small Quantities of Bromine in Mineral Waters.*

M. Henry recommends the following method:—The mineral water is precipitated with a very acid solution of nitrate of silver, the edulcorated precipitate placed in contact with zinc and dilute sulphuric acid; when reduced, barytic water is added in excess; it is then again filtered, the liquid evaporated to dryness, the residue pulverized, treated with alcohol of 0.828 at a gentle heat, filtered and



evaporated. The deliquescent salt which remains behind (bromide of barium with slight traces of chloride of barium) is dissolved in a little water, conveyed into a glass flask, some powdered manganese and sulphuric acid added in slight excess, and the aperture closed with a cork, into which a tube twice bent at right angles is fitted, the longer arm of which is blown out in the centre to a bulb, but is drawn out inferiorly and dips half a line into water. On heating the mixture, bromine, if present, is evolved as a reddish gas, which is condensed in the bulb to brownish drops. These are washed from the tube with some æther or water, precipitated with nitrate of silver, and the bromide of silver obtained weighed.—*Ann. der Chem. und Pharm.*, Dec. 1842.

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## PHARMACOLOGY.

### *On the Aconitum ferox or Bish, as a Source of Aconitine.*

THIS plant, which belongs to the same genus as the European species, and the roots of which abound in the markets of Hindostan under the name of “Bish,” forms one of the most celebrated articles in Indian medicine and toxicology. Dr. O’Shaughnessy informs us, that a preparation of the root is much used in all the hilly districts in India to poison arrows for the destruction of wild beasts. It is seldom however obtained sufficiently fresh in the plains to produce such effects as would explain its alleged utility for this purpose. It has been used on several occasions to poison wells and tanks, and doubtless might be made a formidable means of defence against the invasion of the territories in which it abounds.

In medicine the bish is chiefly employed by the natives in the treatment of leprosy, fever, cholera and rheumatism. In Europe the wolf’s bane, or monk’s hood (*A. Napellus*), has long been deemed efficient in many painful and spasmodic affections. The extract has been generally employed, commencing with half a grain, repeated thrice daily, and gradually increased until a tingling sensation of the affected part is produced. From 3 to 5 grs. daily have thus been taken, not only with impunity, but with the effect of checking or even removing many forms of nervous disease.

The Indian species has been employed in the form of tincture internally in the treatment of a great number of cases of chronic rheumatism. We commenced with 10-drop doses thrice daily, and proceeded gradually to 2 drachms in 12 hours. The effects observed were numbness of the mouth and fauces, diuresis, increased appetite, in a few cases slight giddiness, and in about three-fourths of the cases alleviation of the rheumatic pains. The tingling described by Dr. Duncan occurred in several instances, and was the certain precursor of the suspension or cure of the disease. We did not notice any effect on the bowels; in those who had no diuresis gentle perspiration usually occurred. No tendency to sleep followed in any of our cases.



Externally we have used the extract, made into an ointment as directed in the Pharmacopœia, in a few cases of severe facial neuralgia and painful nodes. From 1 to 2 drachms of the ointment were rubbed on the affected part, which was then covered with a plantain-leaf; numbness generally followed in half an hour, then a sensation of warm tingling, and usually a decided remission of the pain for several hours. These frictions may be repeated thrice daily with perfect safety.

Our experiments were instituted in imitation of those made by Dr. Turnbull in England with the alkali aconitine. Our results fairly bear out his statements, and show the method he introduced to be one of great practical value. In England aconitine costs 1s. 6d. a grain, which high price is an almost insuperable obstacle to its extensive use. The extract however may be used, in a large proportion of cases, with equal benefit.

We would recommend those chemists who prepare the vegetable alkaloids to make some experiments upon this root, with a view to the production of aconitine at such a price as shall render this powerful remedy generally applicable.

#### *On the Pucha Pat.*

This is a well-known article in Bengal; its source however is still doubtful. Dr. Wallich has given the following notice of it, which we take from the Bengal Dispensatory:—

“The drug to which I allude is called in Bengallee, as well as in Hindee, *Puchá Pât*, and is found in every bazaar almost throughout Hindustan. My esteemed friend Baboo Radhakaut Deb informs me, that ‘there exists no Sanscrita name for this leaf, which is largely imported by Mogul merchants; that it is used as an ingredient in tobacco for smoking, and for scenting the hair of women; and that the essential oil is in common use for imparting the peculiar fragrance of the leaf to clothes among the superior classes of natives.’ I believe that the people of the peninsula are peculiarly fond of this perfume, as are also the Roman Catholic inhabitants of this country generally.

“Having ascertained, on my return from Europe two years ago, that a large quantity of what appeared to be the same drug as that commonly sold in the bazaars under the name of *Puchá Pât* had been imported from Penang, I requested Mr. George Porter, late of that island, and formerly in charge of the botanical establishment there, to favour me with an account of the article, and also, if possible, with some growing plants of it. In February last year (1834) I had the pleasure to receive from him several plants, which I have succeeded in multiplying by cuttings, and which appear to thrive remarkably well in this garden. Mr. Porter has furnished me with the following memorandum:—‘The *Puchá Pât* grows perfectly wild at Penang, and on the opposite shore of the Malay peninsula in Wellesley province. The Arabs use and export it more than any other nation. Their annual pilgrim-ship takes up an immense quantity of the leaf.



They use it principally for stuffing mattresses and pillows, and assert that it is very efficacious in preventing contagion and prolonging life. It requires no sort of preparation, being simply gathered and dried in the sun. Too much drying however is hurtful, inasmuch as it renders the leaf liable to crumble to dust in packing and stowing on board. In Penang it sells at the rate of a dollar and a quarter to a dollar and a half per pekul. In Bengal some which was sent from thence several years ago sold at 11 rupees 8 annas per maund. At times the price is much higher. The last investment sold so low as 6 rupees only per maund. It has not been seen in flower.'

"The Puchá Pât plant is evidently of the family of *Labiataë*. It forms a shrub (in the Botanical Garden) of 2 to 3 feet in height. The obtusely four-cornered branches and the leaves are juicy, and somewhat fleshy and covered, especially the inferior surface of the latter, with a great deal of soft pallid pubescence, which gives the plant a grayish appearance. All the young parts are densely villous. The leaves are opposite, petioled, ovate, obtuse, grossly and obtusely lobato-crenate, measuring from 2 to 4 inches; the lowermost on the branches are subcordate; all the others are cuneate and entire at the base; the upper surface slightly rugose, under surface pallid, with very thick ribs and nerves and largely reticulated veins.

"None of the individuals in this garden have hitherto shown any disposition to blossom, owing perhaps to the plant being so easily multiplied by division. All the green parts, on being rubbed, emit the peculiar smell of the drug sold under the name of *Puchá Pât*, which is also very like our shrub in the form, margins and surface of the leaves. I should have mentioned above that Baron Hügel informs me, that he has found a plant growing wild at Canton, which closely resembles that from Penang cultivated in this garden.

"Whether *Marrubium odoratissimum Betonicæ folio*, J. Burm. Thesaur. Zeylan, p. 153, tab. 71, fig. 1, be our plant or not it is difficult to say; but it strikes me that there is at least a considerable affinity between them."

## CHEMICAL PREPARATIONS.

*On the Impurities of Sulphate of Potash, and the Dangers which may result therefrom. By M. MORITZ.*

THE 'Journal de Pharmacie' has recently published an account of two cases of poisoning by sulphate of potash. The author of this paper draws attention, in a recent Number of that periodical, to a similar one that had occurred to him some years ago, and points out the causes to which these effects must be attributed. In the case which had come under his notice, the sulphate had been prescribed as an antilactic in a dose of 16 grms., to be taken in two portions. The first portion gave rise to all the symptoms of poisoning, which being got under in time, did not terminate fatally. The physician thought, with some reason, that there had been some mistake on the part of the chemist, and



the remaining portion was sent to M. Moritz for examination. It was found to be sulphate of potash, but contaminated with a considerable quantity of sulphate of zinc, to the presence of which the violent and numerous retchings, &c. were ascribed. Out of 8 samples of this salt, which were procured from various sources, 2 contained zinc. There exists in fact in commerce some sulphates of potash which contain zinc, and sometimes zinc and copper at the same time. This salt is often a secondary product from the manufacture of nitric acid. In Germany the sulphate of potash is frequently employed, sometimes as a slight purgative, sometimes as an alterative, and I am not aware that any poisonous effects have been observed in that country as resulting from its use. But this is accounted for from the most recent Pharmacopœias and elementary works directing the attention of the chemist to a possible impurity of this salt, which results from a series of operations, and which the chemist more frequently purchases than prepares. The 'Pharmacopœia' of Prussia of 1829, states expressly under the head of *Kali sulphuricum crudum*, "*Rejiciendum quod metallis præcipue zinco et cupro inquinatum est.*" There is no such article respecting this salt in the French codex, although it forms part of Dover's powder, and also constitutes the base of Stahl's powder. The author concludes that the unusual effects of the sulphate of potash must be attributed to the presence of a poisonous metal, and advises the chemist, who does not prepare this sulphate himself, always to examine and to purify it, as the commercial salt frequently contains many impurities.

*Argentum muriaticum ammoniatum.*

This preparation is best obtained by saturating boiling *liquor ammoniæ* with freshly precipitated and carefullyedulcorated chloride of silver. The saturation must be effected at such a temperature that the solution is on the boil. It is filtered while boiling and preserved from light; on cooling it deposits very regular crystals, which are dried between bibulous paper, and are conveyed immediately into a well-stoppered bottle.

The ammonio-chloride of silver is of a bluish-white colour, has the peculiar smell of ammonia, and a burning, almost caustic taste. Exposed to the air it gradually gives off ammonia and acquires all the properties of chloride of silver, still retaining however the same form of crystal. When the crystals are preserved in the ammonia in which they formed, they do not undergo the least change in their colour from the influence of light. Water decomposes the salt; one portion saturated with ammonia dissolves, while a considerable portion containing a small quantity of ammonia remains undissolved. Exposed to the action of heat, it undergoes the same decomposition as when in contact with the atmosphere, only more rapidly.

Another preparation, which should be noticed here, is the *liquor Argenti muriatico-ammoniatum*, which has been strongly recommended by Dr. Kopp in cases of chronic diseases of the nerves. It is prepared as follows:—



R<sub>x</sub> *Argent. nitr. fus. gr. x.; aq. distill. ʒij.; Solutioni filtratæ instilla Liquor. Natr. muriati q. s. ad præcipitandum. Præcipitatum sedulo ablutum solve in Liq. ammon. caustic. ʒjβ., adde Acid. muriat. ʒjjj. vel q. s. ut præcipitatio evitetur et Argentum muriaticum in statu solutionis permaneat. Pondus fluidi filtrati æquale sit ʒjjβ.*

The clear liquid deposits, when exposed to the influence of light, black flakes. It is therefore requisite to preserve it in a dark place in small bottles, the outside of which has been coated with black paint, and the phials in which it is dispensed should also be covered with black paper. Acid nutriment should be avoided during its employment. One drachm of the solution contains about half a grain chloride of silver.—Geijer's *Pharmacop. Univers.*

### *Remedy for Burns.*

TO THE EDITORS OF THE CHEMICAL GAZETTE.

GENTLEMEN,

In the last Number of the 'Chemical Gazette' you quote from the 'Gaz. des Hôpitaux' a remedy for burns, composed of oil of almonds and lime-water. Allow me to inform you that at Guy's Hospital the application of linseed-oil and lime-water, sometimes in combination with, sometimes without turpentine, has been very many years employed with great benefit and success after these injuries.

I remain, Gentlemen,

Your obedient Servant,

May 17th, 1843.

JOHN BIRKETT.

### *On the Employment of the Mucilage of the Quince-seed for Poultices. By M. GAROT.*

The author proposes the use of dried mucilage, which he prepares in the following manner:—

R<sub>x</sub> Quince-seed ..... 100 grms.  
Macerate for some hours in

Hot water of 106° to 126° ..... 3 kilogrms.

Press, evaporate down to 3 quarts at a gentle heat, and finish the drying in the warm chamber. In this manner about 10 grms. of a dry friable transparent product are obtained, which absorbs and converts into mucilage a far larger portion of water than gum-tragacanth. 1 decigram. of the dried mucilage suffices to communicate to 100 grms. of water a semi-syrupy consistence.—*Journ. de Pharm.* for April.

### *Preparation of pure, perfectly white Jalap Resin.*

Each root is cut, according to M. Nativelle, into from two to three pieces, over which boiling water is poured, and the following morning, when they have become much swelled, they are cut into very small slices. These are now repeatedly digested with water, and submitted to strong pressure until the water runs off colourless, which is usually the case after three boilings. The roots are then



treated in a tin vessel in the water-bath three times with alcohol of 0.898 sp. gr., pressed, the amber-yellow coloured tinctures treated with some animal charcoal, filtered, and the alcohol distilled off. The resin which remains behind after pouring off the supernatant water is colourless, and has the appearance of turpentine; it is well dried in a dish. When the fine powder of this jalap resin is brought into contact with cold water, it combines with it to form a transparent semi-liquid mass as when fused. Mixed with a certain quantity of colophony, it likewise combines under water. The mass however remains non-transparent.—*Ann. der Chem. und Pharm.*, Dec. 1842.

*On the Preparation and Composition of Curcumine.*

M. Vogel, Jun., has examined more accurately the resinous colouring matter of the curcuma root. Curcumine may be obtained, according to him, by treating the pounded root repeatedly with boiling water until it no longer becomes coloured. The dried residue is then extracted with hot alcohol of 0.863 spec. grav., the clear dark brownish-red filtered solution evaporated, and the residue treated with hot æther, which dissolves the curcumine; but it then still contains volatile oil and traces of chloride of calcium. For further purification the æthereal solution is evaporated to dryness, the residue dissolved in alcohol, and precipitated with sugar of lead. Theedulcorated precipitate is suspended in water, decomposed with sulphuretted hydrogen, and the filtered and dried precipitate treated with æther, which dissolves the curcumine, leaving behind sulphuret of lead. On evaporation of the æther the curcumine is obtained in transparent scales, which are not crystalline, are void of smell, and afford on pulverization a yellow powder. In a mass it is of a cinnamon brown; with transmitted light, dark red. It melts at 104° Fahr., dissolves very slightly even in boiling water, but easily in alcohol, æther, in volatile and fat oils. The alcoholic solution is precipitated by gelatine.

The analysis of the curcumine separated from the lead compound gave in 100 parts—

	I.	II.	III.	IV.
Carbon . . . . .	69.548	69.507	69.466	69.485
Hydrogen . . . . .	7.539	7.641	7.502	7.159
Oxygen . . . . .	22.913	22.852	23.032	23.356

The amount of oxide in the lead compound varied between 43.67 and 56.33 per cent.

Exposed to the light of the sun, curcumine becomes gradually yellowish-white; it dissolves very readily in concentrated sulphuric, muriatic and phosphoric acids with a crimson-red colour. On the addition of water the colour disappears, and yellowish-green flakes are deposited. Concentrated acetic acid dissolves it without any change of colour; nitric acid decomposes it.

Boracic acid does not alter the colour of the curcumine dissolved in alcohol, but on evaporation a crimson-red combination is deposited. Curcuma paper is however coloured by an alcoholic solution



of boracic acid of a deep orange-red, which colour is converted into a beautiful blue by ammonia and other alkalies. Curcuma paper is coloured blackish-gray by a solution of borax. In alkalies curcumine dissolves with a reddish-brown colour. The same change of colour is also produced by various basic salts of lead and of oxide of uranium.—*Ann. der Pharm. und Chem.*, Dec. 1842.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*Description of a new Battery for Electro-gilding and Metallurgical Processes.* By M. DE LA RIVE.

IN a valuable memoir recently communicated to the French Academy, M. De la Rive has shown that, by constructing a simple battery in which the nitric acid is replaced by a peroxide, and especially by peroxide of lead, it is capable, even when charged only with one liquid, acidulated or salt water, of decomposing water with very great energy, at the same time giving off the gases separately. As this promises to be of great advantage in many processes in which electricity is employed in the arts, we have thought the following extract might prove interesting to our readers. Speaking of Grove's battery, M. De la Rive states that he attempted to substitute a peroxide in powder for nitric acid, which would have two advantages; first, that of diminishing, like the nitric acid, the resistance; and secondly, of obtaining a current by the reduction of the peroxide, the direction of which, being similar to that of the current resulting from the oxidation of the zinc, would considerably increase the electro-chemical power of the pair. There is moreover a great practical advantage in the substitution of a peroxide for the nitric acid, as but one liquid only is then requisite for charging the battery.

The experiments were made with the peroxide of manganese and of lead; the latter was found to be decidedly superior. The peroxide, reduced to the state of a fine dry powder, is heaped with care in a porous porcelain vessel, and the plate of platinum placed in the middle of it, so that it is completely surrounded by the peroxide. This plate has an appendage, to which is fixed a copper conductor. The liquid in which the porous vessel, filled with the peroxide, and the zinc plate are immersed, may be either salt water or sulphuric acid diluted more or less with water.

With the peroxide of manganese only two cubic centimetres of gas were obtained per minute, and the effect became very quickly weaker. With the peroxide of lead even 10 cubic centimetres of gas were obtained per minute, and the effect did not cease although it became somewhat more feeble. Its energy may be entirely restored by changing the direction of the current in the voltameter; the polarization of the electrodes of platina, which is the cause of the apparent diminution of the intensity of the current, is thus destroyed. A pair of Grove's construction gives rise under the same circumstances to a scarcely perceptible decomposition; the



difference is much less with regard to calorific effects. A pair of Grove's indicate  $425^{\circ}$  on Breguet's helix; a perfectly similar pair, but in which peroxide of lead was substituted for nitric acid, produced  $450^{\circ}$ . Several comparative experiments made with a pair of Bunsen's (Grove's battery, in which charcoal is substituted for platinum), with a pair of Daniell's, &c., have all proved the vast superiority of the peroxide of lead battery, especially for chemical effects. These effects with the other batteries are either null or almost insensible.

The length of the action is considerable with the peroxide of lead battery, if care be taken to depolarize now and then the electrodes. This battery is extremely convenient, as it only requires the employment of one liquid, which is very easily procured, *i.e.* of salt water or weak sulphuric acid; so that, both in this respect, as well as with regard to economy, it will replace the compound batteries, which are always dearer and more complicated, in the applications of electricity to gilding, silvering, and to metallurgical processes in general.

The superiority of the peroxide of lead batteries is not sustained when several are arranged in a series. A single pair afforded  $14^{\circ}$  on a calorific galvanometer formed of a platinum wire 12 centimetres in length and half a millimetre in diameter, which the current had to traverse. Two pairs in a series indicated  $18^{\circ}$  on the same galvanometer, and afforded 24 cubic centimetres of gas per minute. Two pairs of Grove's gave under the same circumstances  $19^{\circ}$  on the calorific galvanometer and 27 cubic centimetres of gas per minute. But it is very curious that a battery constructed with a pair of Grove's with nitric acid, and of a pair with peroxide, gave effects surpassing those which had been obtained with a Grove's battery of two pairs, or of two pairs with peroxide of lead. It afforded  $24^{\circ}$  on the calorific galvanometer instead of  $18^{\circ}$ , and 32 cubic centimetres of gas per minute instead of 24 or of 27. This superiority is founded on the reciprocal chemical action of each pair on the other pair. A battery of 3 pairs of peroxide of lead gave 72 cubic centimetres of gas per minute. It heated the platinum wire of the calorific galvanometer to redness; and lastly, it gave a beautiful light with the charcoal points. But employed in series, the peroxide of lead batteries have not a very constant power, and a deposit of oxide of zinc is formed on the sides of the porous vessels, which must now and then be removed.

It would seem, from what precedes, that in order for a pair to produce such chemical effect, for instance to decompose water with platinum electrodes, it is requisite that there exist two chemical actions in the pair, giving origin to two currents, the effects of which are combined, the oxidation of the zinc and the reduction of a peroxide.—*Comptes Rendus*, April 17.

#### *On the Oil of Madia sativa.*

The cultivation of this plant for the production of oil having been recently recommended in this country, the following notice from



M. Pasquier's 'Monographie du Madi Cultivée' will be of interest to some of our readers.

The plant succeeds well on dry, light, unmanured soil, and affords then, on an average, and in comparison with other oil-plants, the following amount to the hectare (about 200 square roods):

Madia sativa .....	1726	kilogrammes seed.
Myagrum sativum.....	1250	... ..
Papaver somniferum.....	1200	... ..
Brassica campestris .....	1050	... ..
Brassica napus .....	900	... ..

The average amount of oil will be evident from the following table.  
100 parts seed give of—

Madia sativa .....	32	parts oil.
Papaver somniferum.....	32	...
Brassica campestris .....	28	...
Myagrum sativum.....	26	...
Brassica napus .....	26	...
Linum usitatissimum .....	21	...
Canabis sativa .....	20	...
Olea europæa .....	18	...

The *cold* pressed oil is of a golden-yellow colour, of sweet agreeable taste like nut-oil, and almost void of smell, and is only inferior as a salad-oil to the very finest olive-oil. At 65° Fahr. its specific gravity is 0·917; at 13° Fahr. it is still fluid and of the consistence of syrup. It is the least subject of all the usual oils to become rancid. The *hot* pressed oil (the larger amount) differs only in its less agreeable taste and smell and its orange-yellow colour. As a burning oil it affords a pure white flame, and under similar circumstances a quart burns 14 to 18 hours longer than rape-oil. It is obtained perfectly colourless and transparent by treatment once or twice with animal charcoal. Alcohol of 0·848 spec. grav. dissolves but little of it; æther dissolves it in every proportion. It is a solvent for sulphur and phosphorus. By treating 100 parts of the oil with 1½ part sulphuric acid of 1·834 spec. grav., it is entirely freed from mucus and albumen. It is well adapted for all pharmaceutical preparations, for instance ammonia soap, hair oils and pomades, lead plaster, &c. It also affords excellent potash and soda soaps.

## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

May 2nd, 1843. (William Thomas Brande, Esq., Vice-President, in the Chair.) The following communications were then read:—

“Additional Remarks on Theine,” by John Stenhouse, Esq.

In the analyses given by Dr. Stenhouse in his previous papers, the quantity of nitrogen was omitted from want of material: these are now subjoined. From this substance, obtained by sublimation, the author obtained by analysis, 49·72 C = 16 at., 5·14 H = 10 at., 28·78 N = 2 at., 16·36 O = 4 at. These numbers agree closely with those obtained by calculation. In the preparation of theine from the Paraguay tea, the author suggests an improvement on the former process. The filtered infusion is to be treated with acetate of lead,



and the liquor, after removing the precipitate, to be boiled with excess of litharge, the clear liquid evaporated to dryness and sublimed. 0.13 per cent. of theine were thus obtained, the results of two analyses, which agree well with calculation, give 16C, 10H, 2N, 4O as the composition. The results of four analyses of the double salt of muriate of theine and chloride of platinum give the formulæ  $C^{16}, H^{11}, N^4, O^4, ClH + Pt. 2Cl$ , and the atomic weight of theine as 2455.91. To the substance crystallizing in large shining plates, produced by boiling theine in an excess of nitric acid, the author gives the name of nitro-theine; when crystallized from solution in water it resembles cetine, but having more of a pearly lustre. When sublimed it resembles naphthaline, and is deposited in large and regular rhombohedrons from its æthereal solution by spontaneous evaporation. Dr. Stenhouse corrects his former statement, that this compound does not give off ammonia when treated with solution of potash, which he finds on boiling the material to be the case. The composition of this compound, dried at  $212^{\circ}$ , was 42.0 C, 4.25 H, 19.5 N, 34.25 O; it appears to be a neutral body. Theine yields about from 5 to 6 per cent.

“Note on the Preparation of Æther,” by George Fownes, Ph.D.

According to the experiments of Mitscherlich on the formation of æther, the author states that it occurred to him to try experimentally how far the continuous process might be adopted with the ordinary rectified spirit. A mixture was made of 6 oz. by weight of oil of vitriol, and  $3\frac{3}{4}$  oz. by weight of rectified spirit of spec. grav. .836 at  $60^{\circ}$ . This mixture was introduced into a flask arranged with the necessary means of introducing a thermometer, connecting the flask with the spirit reservoir, and allowing an exit for the vapours to the condenser. It was found that the temperature could be easily maintained at the point required, and a continuous stream of spirit admitted. The process was kept up for 15 hours, and about 20 times the weight of the acid in spirit had been employed. There appears therefore no difficulty in applying Mitscherlich's continuous process to the economical manufacture of æther on the large scale. It is very probable that by avoiding the use of a naked fire much of the secondary action of the sulphuric acid on the alcohol might be prevented. It may be proper to mention also that the mixture in the distillatory vessel may be repeatedly suffered to cool, and again reheated without injury.

### *Society of Civil Engineers.*

*Feb. 14th, 1843.* (The President in the Chair.) The following communication was read:—

“Description of Mr. Clay's new Process for making Wrought Iron direct from the Ore,” by William Neale Clay.

In this communication the author first describes the various stages through which the metal passes, between the reduction of the ore and its arriving at the state of malleable iron, by the ordinary mode of manufacture; and then he explains the process which he has invented, and introduced practically at the Shirva Works.



By the ordinary system of iron-making the ores are reduced into the state of carburet of iron, and then by refining and puddling the metal is de-carburetted, thus making it into malleable iron by a number of processes, which are recapitulated :—

1. Calcining the ore.
2. Smelting in a furnace, by the aid of blast, either cold or heated, with raw coal or coke for fuel and limestone as a flux.
3. Refining the “pig” into “plate” iron.
4. Puddling, shingling and rolling, to produce the “rough,” “puddled,” or No. 1 bars.
5. Cutting up, piling and rolling, to produce “merchant,” or No. 2 bars.
6. A repetition of the same process, to make “best,” or No. 3 bars.

Seeking to diminish the number of manipulations, by the new process a mixture of dry Ulverstone, or other rich iron-ore (hæmatite), is ground with about four-tenths of its weight of small coal, so as to pass through a screen of one-eighth of an inch mesh. This mixture is placed in a hopper, fixed over a preparatory bed or oven attached to a puddling furnace of the ordinary form. While one charge is being worked and balled, another gradually falls from the hopper through the crown upon the preparatory bed, and becomes thoroughly and uniformly heated; the carburetted hydrogen and carbon of the coal, combining with the oxygen of the ore, advances the decomposition of the mineral, while, by the combustion of these gases, the puddling furnace is prevented from being injuriously cooled. One charge being withdrawn another is brought forward, and in about an hour and a half the iron is balled and ready for shingling and rolling.

The cinder produced is superior in quality to that which results from the common system. It contains from 50 to 55 per cent. of iron, and is free from phosphoric acid, which frequently exists, and is so injurious in all the ordinary slags. When re-smelted it produces as much No. 1 and No. 2 cast iron, and of as good quality, as the ordinary “black band” ore of Scotland.

The cast iron produced from the slag (amounting to one-third of what was originally contained in the ore) is mixed with the ore and coal in the puddling furnace; and thus, while nearly all the iron is extracted from the ore, as much wrought iron is produced in a given time, and at the same cost of fuel, as by the old system.

The first process, producing puddled bars of superior quality, is consequently on a par with the fourth stage of the old system, as it avoids the necessity of the preceding separate manipulations.

From the absence of all deleterious mixture, by once piling and reheating the rough bars, iron is produced of a quality in every respect equal, and in powers of tension superior, to that which results from the second piling and reheating in the common mode; it is therefore contended that the two processes produce from the hæmatite nearly one-third more iron, of as good quality as is usually obtained by the six processes of the old system.

The iron thus produced bears a high polish, is very uniform in its texture, is ductile and fibrous, having more than an average amount



of tensile strength, and at the same time appears to be more dense, as it possesses a peculiar sonorousness, resembling that of a bar of steel when struck. It has also been converted into steel of a good quality.

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In a conversation which ensued after the reading of this paper, Mr. Clay contended that the ordinary method of making iron was neither so scientific nor so practically good as there was reason to expect it would have been, when iron formed so considerable an item in the productive industry of the country. His invention was in some degree based upon the old Catalan fire, wherein malleable iron was produced direct from the ore, although by a considerable expenditure of fuel. By his process the ore was also reduced at one operation into the state of malleable iron, by combination with a large portion of carbonaceous matter; and as the deoxidation of the ore could proceed simultaneously in an adjoining preparatory bed, through which the flame of the puddling furnace traversed, there was necessarily a great saving of time, labour and fuel in the production of the metal, while the quality was at the same time improved. He argued therefore that if the system was generally adopted, a large portion of the capital now sunk in the expensive constructions of blast furnaces, blowing engines, &c., would be dispensed with.

Mr. Taylor observed, that the process appeared to be only applicable to the rich qualities of iron ore, which were now used in comparatively small quantities, as a mixture with the clay iron-stones of the coal-fields, from which iron was generally produced in this country. There existed large quantities of hæmatite in Great Britain equal in quality to that of Nassau or of the Hartz mountains, from which so much iron was made for converting into steel. The mines of Ulverstone alone now produce 50,000 tons annually, and at least 25,000 tons more could be shipped from Cornwall; and if a demand existed, there was scarcely a limit to the quantity that could be raised. He apprehended that the iron made by this process could be converted into good steel. This was very desirable, as it would render this country independent of Sweden and Russia, whence nearly all the steel iron was now imported.

Mr. Heath had examined Mr. Clay's process of iron-making, and found that the wrought iron produced from a mixture of Scottish pig iron and hæmatite ore was of a superior quality, bearing severe tests without injury. The iron made by this method, from Indian pig iron and specular iron ore (peroxide of iron) from Devonshire, which was identical in quality with the celebrated Elba ore, when converted into cast steel by a process which he had accidentally discovered, possessed the quality of welding like shear steel, without any of its defects. The method he alluded to was to combine manganese with the cast steel in the crucible, and when drawn out under the tilt hammer it could be worked and welded to iron like shear steel. The consequence of this discovery was, that the latter quality of steel was almost abandoned for cutlery, and the former was now generally used, as it did not exhibit the laminated appearance when polished, which shear steel frequently did. The metal was sounder,



and fewer wasters were made. All the brown hæmatites contained manganese, and there was little doubt that, by selecting the proper kinds of ore, malleable iron might be made in Great Britain by this process, as good for converting into steel as any of the Swedish iron. There was abundance of specular iron ore on Dartmoor equal to the Elba ore, and which would (he had little doubt) produce as good iron as that from the Dannemora ore.

Dr. Faraday remarked, that the process invented by Mr. Clay was founded on sound chemical principles. It was desirable to abandon the use of limestone as a flux; it was proved that the purest limestones contained phosphates, which, although advantageous in agricultural processes, were detrimental in iron-making.

Mr. Fox had tried some specimens of Mr. Clay's iron, and found them to bear severe tests, as well as the best cable bolt iron made in the ordinary manner.

Mr. Clay explained that Mr. Heath's process was not indispensable for converting into steel the iron made by his method; and also that argillaceous iron ores, after calcination, could be treated in his furnace like the hæmatite ores, but not so advantageously.

Mr. Taylor said that 25,000 tons of steel were converted annually in this country, and of that quantity not more than 2500 tons were made from the best Swedish iron; for the remainder, inferior qualities of iron, such as Russian iron, marked CCND, from the forges of Monsieur Demidoff, were used. All that iron was made with charcoal, and could only be called inferior when compared with that made from the Dannemora ore. If Mr. Clay's process was successful in treating the hæmatite ores, as had been stated, it was of great importance, as it would emancipate the country from a dependence upon foreign products.

He had recently seen in Germany a process of producing steel by stopping the operation of puddling pig iron at a certain point, or intermediate state between cast and wrought iron, and hammering the mass at once into bars. The operation was one of much delicacy, and depended entirely upon the skill of the workman.

Mr. Heath believed the manufacture of steel was involved in unnecessary mystery. It was the general opinion that foreign iron was essential to produce good qualities. Iron as now made from coke-furnaces certainly contained too much foreign matter to be used for steel, and it would require more attention to the selection of the materials before pure iron could be obtained; some of the Low Moor iron, the good quality of which was universally admitted, had been made into blistered steel; but although the springs made with it appeared perfect, it was said that they did not answer so well as those made with steel from charcoal iron.

The Sheffield manufacturers required that steel should possess "nature and body;" the first quality to enable it to be rolled and drawn out without cracking, and the second that it might receive and retain a fine edge. Steel made from Garnderris iron (South Wales) possessed "nature," but if made into cast steel it fled into pieces in working, as it did not possess "body." Steel from German roes appeared to have "body," but wanted "nature." Steel from



Indian iron, although difficult to work, stood better than other kinds when once reduced into form. This he attributed to the purity of the magnetic ore from which it was produced; there was not the slightest trace of phosphorus, arsenic, or any deleterious foreign matter. He was convinced that, with a mixture of Indian pig iron (which could be produced very cheaply) and Devonshire ore, by Mr. Clay's process iron could be made of excellent quality for converting into steel at such a reduced price as would render the introduction of Swedish and other foreign iron unnecessary.

Mr. Taylor believed that improvement in the quality of steel, rather than reduction in the price, was the object to be sought. In the large quantity used in the mines under his direction, the dearest steel was found to be the more economical. He had seen as many as twelve dozen borers used to make one blast-hole, and unless the tools kept their points well the labour of the men was thrown away.

### PATENTS.

*Patent granted to Peter Kagenbusch, Sandsend, York, for an Improvement in the Dyeing of Wool, Woollen Cloths, Cotton, Silks, &c.*

THIS improvement consists in producing a mordant, to be used for fixing the colours in cloths, silks, &c., by operating upon the residual mother-liquors of alum-works; that is to say, the mother-liquor of the alum-meal, rough alum, or alum for rocking, from which the Epsom salts have been taken in one or more crops. The patentee uses the residual mother-liquor of that manufacture in which muriate of potash has been employed for the alkaline base, in preference to the mother-liquor of that wherein sulphates are used; and he also prefers the liquor of the alum from the natural rock or schist to the mother-liquor of the rough alum, from what is generally termed the "artificial alum process."

The method of operating upon the residual mother-liquor is as follows:—A solution of common salt or brine is added to the mother-liquor when boiling, for the purpose of neutralizing the sulphuric acid contained in it; the quantity of brine to be added depends entirely upon the amount of sulphuric acid in the liquor; but in general a saturated solution of salt, equal in quantity to about one-twelfth of the mother-liquor, will be found sufficient. The liquor is now ready to be used for dyeing all colours with the exception of red, and if not sufficiently strong it may be brought to the required strength by continued boiling and evaporation.

When the above product or mordant is to be conveyed from one place to another, it is boiled until sufficiently concentrated, and is then allowed to crystallize; the crystallized substance should be protected from the action of the atmosphere, and when required for use it is to be dissolved in water. In some cases the solution of salt is added to the mother-liquor previous to taking the last crop of Epsom salts; that is, when boiling up for the last crop. When the salts have been removed in the usual manner, the residual liquor is ready for use as a mordant.—Sealed May 26, 1842.



# THE CHEMICAL GAZETTE.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Deleterious Effects of Ammoniacal Salts on Vegetables.*  
By M. A. BOUCHARDAT.

THE efficacy of ammoniacal salts in manures is at present generally admitted by those chemists who have directed their attention to the application of chemistry to agriculture. Some experiments made by M. Bouchardat have led him to a different conclusion. The ammoniacal salts which he has examined are the sesquicarbonate, the bicarbonate, the sulphate, the muriate, and the nitrate, the only ones which in the natural course of things are presented to the roots of plants.

Some branches of *Mimosa pudica* were placed separately in flasks provided with a pierced cork and filled with filtered Seine water. They soon became provided with adventitious roots, and the foliage became green and very sensitive. The most vigorous were selected, and the water of several of the flasks was replaced by solutions of distilled water containing  $\frac{1}{1000}$  of one of the above-mentioned ammoniacal salts. The others were kept in pure water for comparison. After 24 hours the plants still vegetated well, but the leaves had lost part of their sensitiveness. After 48 hours, the plants growing in the flasks containing solutions of carbonate of ammonia were deprived of all motion, the lower leaves had fallen off; the next day the branches were dead. The plant of *Mimosa* growing in the nitrate of ammonia resisted a day longer, that which was in the solution of the hydrochlorate resisted two days, but after six days all the plants had perished. The solutions of the ammoniacal salts reduced to  $\frac{1}{1300}$  produced the same results. During this time the plants which had remained in pure water continued perfectly well.

Some branches of *Mentha aquatica* and *sylvestris*, and of *Polygonum orientale*, known by the facility with which they vegetate in pure water, in which situation they are able to produce fertile seed, perished much sooner from the absorption being more active. Some solutions containing  $\frac{1}{3000}$  had also a bad influence; more diluted, they did not produce any favourable or injurious effect that could be appreciated.

To operate on plants placed under similar conditions to those in which they are found in nature, M. Bouchardat made choice of a plant which does not vegetate in water, but which grows luxuriantly in



manure, and which is considered greedy of azotized elements,—the common cabbage (*Brassica oleracea*).

Some individuals of equal weight and of nearly similar strength were placed in separate cases of the same size, containing an equal weight of garden-earth and of manure. Those which were watered with ammoniacal solutions became neither more nor less developed than those for which filtered Seine water was employed.

M. Bouchardat attributes the innocuity of the ammoniacal salts in this case to their not being absorbed, but retained by the manure. From his experiments he draws the following conclusions:—

1. The solutions of the following ammoniacal salts, the sesquicarbonate, bicarbonate, hydrochlorate, nitrate, and sulphate of ammonia, do not supply the vegetables with the azote which they assimilate.

2. When solutions containing  $\frac{1}{1000}$  of these salts are absorbed by the roots of plants, they act just like strong poisons.—*Journ. de Pharm.* for April 1843.

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In a note appended by the Editors of the 'Journal de Pharmacie' to the above article, it appears that the solutions of the ammoniacal salts in filtered Seine water had the same result as those which were made with distilled water. The question is however whether the plants had not perished for want of nourishment rather than by poison. It may be with these as with man; we know, for instance, that with the latter one kind of food, however nourishing it may be, cannot support life. Besides, it appears that the same plants were able to live, although for a less time, in distilled water as well as in the filtered Seine water.

#### *Analysis of Guaiac Resin.* By M. JAHN.

When pulverized commercial guaiac resin is exhausted with æther (in which operation the æther extracts from 1 oz. of guaiac 3 drachms 5 grains), and the solution is evaporated to drive off the æther, the residue will be found to contain two resins, one of which dissolves easily when digested with ammonia, while the other, which forms the larger portion, is of far more difficult solution in ammonia. The insoluble portion, which remains behind after treating the æthereal extract five or six times with ammonia, amounts when perfectly dried to about 2 drachms 20 grains. No ammonia could be found in it that might have remained in chemical combination with the resin. 45 grains therefore of that portion of the guaiac, soluble in æther, are also easily soluble in ammonia.

The greenish-yellow coloured solution of the *resin easily soluble in ammonia*, may be mixed with water without any opakeness resulting; but if exposed to the air a yellowish-green resin is deposited on the sides of the vessel, which however is again perfectly soluble on restoring the ammonia which had escaped. When the resin is precipitated from this solution with dilute sulphuric or hydrochloric acid, it separates in a pulverulent form. It dissolves in this state entirely in alcohol; but when its ammoniacal solution



is heated to drive off the ammonia, it is then no longer entirely soluble in alcohol, but a grayish-brown sediment remains, which shows therefore that the ammonia acts upon the resin, or that the resin itself is altered during the application of heat. The resin recently precipitated by an acid becomes soft when conveyed into hot water, and the greater portion dissolves in the water on boiling with a yellow colour, while a small portion of a brown colour, consisting apparently of a harder resin, remains undissolved. The first portions, especially of the resin extracted with the ammonia from the æthereal extract, afford, when thrown down by an acid, a resin soluble in water; while from the subsequent extracts a greater portion always remains insoluble in water. When however these insoluble portions are dissolved in alcohol, hot water may be added to their solutions without causing any deposit, but on cooling a portion of the resin separates. The part soluble in water, as well as the insoluble portion, are dissolved by concentrated sulphuric acid with a purple-red colour; and on diluting with water the resin is separated of a violet colour.

The solution of this resin in alcohol or in water has a pleasant aromatic taste. The alcoholic solution is not immediately precipitated by an alcoholic solution of acetate of copper; the blue mixture changes into green, but continues transparent, and only after a considerable length of time does an inconsiderable deposit take place. It is precipitated by nitrate of silver of a grayish-white, which soon becomes black; by sulphate of copper of a grayish-green. The ammoniacal solution is immediately coloured blackish-green by nitrate of silver, and after some hours deposits a black sediment; it is thrown down by sulphate of copper of a dark gray-green.

*The resin of difficult solution in ammonia* cannot be said to be entirely insoluble, for after long-continued digestion the ammonia takes up a portion of it with a yellowish-green colour. Its combination with ammonia (if it can be so termed, since after driving off the ammonia the resin separates in an insoluble state) requires far more water to dissolve it. It might be regarded as the beta-resin of Unverdorben\*, but it differs from it in one of the most essential points. Its alcoholic solution (when the resin has either been precipitated by an acid, or freed from ammonia by evaporation and then dissolved in alcohol) is very strongly coloured of a dark blue by an alcoholic solution of acetate of copper, and after a time a precipitate of the same colour is deposited.

The solution of this resin in alcohol is precipitated by nitrate of silver of a dark blue, which soon becomes black; the ammoniacal solution is precipitated by nitrate of silver of a yellowish-white; after some time the precipitate becomes brown, but not black; it is thrown down by sulphate of copper of a bluish-green. Its alcoholic solution is further coloured intensely blue by *Spirit. nitri dulcis*, which property is also peculiar to the one above described, but does not

\* Unverdorben found in his analysis of Guaiacum two resins, one of which, called by him *alpha-resin*, dissolved easily in ammonia, the other *beta-resin*, was scarcely soluble in that medium.—ED.



belong to the resin which will be subsequently noticed. The aromatic smell and taste of the resin proves however that it is very closely allied to the first resin, to which moreover it is in so far related, that the resin, after treatment with ammonia, when washed and dried becomes soft on boiling with water, in which it is not wholly insoluble; that, further, when water is added to its solution in alcohol, it also exhibits greater solubility. Concentrated sulphuric acid dissolves it with an equally beautiful red colour. The solutions of both the resins are coloured yellow by alkalies; the two resins however differ in consistence, which is harder than that of the resin of the æthereal extract of guaiac soluble in ammonia.

When the portion of guaiac insoluble in æther is digested several times with ammonia until entirely exhausted, the ammonia takes up 27 grains, and there still remains a considerable portion undissolved (28 grs. in weight from an ounce of resin which had been employed for the examination). This insoluble portion is a mixture of wood and pieces of bark with a brownish-yellow humus-like substance.

*The resin insoluble in æther, but soluble in ammonia*, has the following properties:—Its ammoniacal solution has a much darker brown appearance than those of the two previously-described resins; and while these latter are separated from their ammoniacal solutions by acids of a yellowish-green colour and in pulverulent form, this third resin, on mixing its solution with dilute sulphuric acid, separates rather as a gelatinous blackish-gray precipitate, and, when considerably diluted, of a reddish-brown colour, resembling in appearance a precipitate of alumina containing peroxide of iron. The resin thus precipitated does not dissolve entirely in alcohol, but only a small portion of it. A slight greenish opacity is caused in this solution by an alcoholic solution of acetate of copper, by no means so considerable, or at all to be compared to that which the same reagent produced in the solution of the second resin. This resin differs therefore entirely from Unverdorben's alpha-resin (easily soluble in alcohol), in which acetate of copper produces a strong precipitate. That portion of the resin which does not dissolve in alcohol is as little soluble in water, but it dissolves of a dark brown colour in concentrated sulphuric acid, from which solution it is not precipitated by water. The resin thrown down by acid from the ammoniacal solution does not dissolve in hot water, and is not even softened in it by long-continued boiling, but on the contrary shrinks together. While the two first resins dissolve in sulphuric acid with a purple-red colour, the one now under consideration forms a blackish-red or brown solution, and is precipitated, on the addition of water, of a blackish-brown, and not of a violet colour. The ammoniacal solution is at first not at all changed by nitrate of silver, but only after the lapse of half an hour is a brownish-black colouring evident, but this is so slight, that, when held towards the light, the liquid still appears transparent. A considerable precipitate is caused by sulphate of copper, which is voluminous and of a grayish-white colour; which last property is peculiar to this resin, and to that which accompanies the benzoic acid in guaiac.



All three resins have a similar behaviour towards fuming nitric acid; they become green.

The two first-described resins also differ from the latter in this respect, that they afford, when exposed to heat, an aromatic empyreumatic oil, which hardens to a resin in the air, and has then nearly the same properties as the resin from which it originated; but the latter scarcely affords a trace of oil when treated in a similar manner.

According to this examination, 100 parts of guaiac resin contain the following constituents:—

Soft resin, soluble in æther and in ammonia . . . . . 18·7 parts.

Soft resin, easily soluble in æther, but with difficulty

in ammonia . . . . . 58·3 ...

Hard resin, soluble in ammonia, but not in æther .. 11·3 ...

Traces of benzoic acid.

Foreign accidental impurities, consisting of pieces of

wood, bark, &c. . . . . 11·7 ...

*Archiv der Pharm.* for March 1843.

### *Action of Metals on Olefiant Gas at a high Temperature.*

*By M. MARCHAND.*

The author observed that the amount of carbon in olefiant gas gradually decreases when passed through a porcelain tube filled with fragments of porcelain at a red heat; a mixture of marsh gas and olefiant gas is obtained, while carbon is deposited in the tube. On passing this gas through a tube filled with copper wire at a white heat, he obtained in the first quarter of an hour nearly pure marsh gas, and when continued longer nearly pure hydrogen. The olefiant gas,  $C^4 H^4$ , is therefore decomposed at first into  $C^2 + C^2 H^4$ , and then into  $C^2 + C^2 + H^4$ . Marchand observes that hydrogen gas may very easily and cheaply be prepared in this manner for filling of balloons, for it would only be requisite to pass common coal-gas through iron tubes, filled with nails, at a white heat.

This decomposition takes place partially in the retorts in which gas is prepared from coals, their interior becomes clothed with a more or less thick covering of carbon, which both weakens the lighting power of the gas and diminishes the durability of the retorts.

The properties of this carbonaceous deposit vary according to whether it is in immediate contact with the retort, or is situated nearer to the inner cavity. Its specific gravity increases from without inwards: thus it was found to be = 2·356, 2·056, 1·982, 1·821, 1·723. The highest number agrees nearly exactly with the specific gravity of graphite. The more dense portion of these masses gives sparks with steel. Graphite, from the exterior close to the surface of the retort, gave 98·38 per cent. carbon, and 1·72 iron, in one case; and 99·80 carbon, and 0·20 iron, in another analysis. Graphite, from the centre of a covering  $1\frac{1}{2}$  inch in thickness, afforded 97·44 carbon, 0·55 hydrogen, and 2·18 ashes, which consisted of peroxide



of iron and silica. This carbon behaves strongly thermo-electric towards bismuth and antimony, the carbon however being in this respect intermediate between the two metals.

When olefiant gas is passed at a low red heat over bright copper wire, this becomes clothed with a very thin layer of a blackish substance, and the copper becomes of a reddish white, and so brittle that it may easily be rubbed to a fine powder. The metal was found to have increased exceedingly little in weight; the black pulverulent coating was carburet of copper, the amount of copper in which varied according to whether it was determined in the upper or inferior layer.

Nickel, palladium and platinum behave in the same manner as copper.—*Journ. für Prakt. Chem.*, xvi. p. 478.

*On Purifying the Air of Stables by a Mixture of Gypsum or Sawdust with Sulphuric Acid.* By HENRY REECE.

Having been invited by Mr. Evans, of Dean House, Enstone, to make some experiments on his excellently-conducted farm and stables, I trust the results of those upon the absorption of ammonia may prove of sufficient interest to entitle them to publication. As gypsum (crystallized sulphate of lime) had been highly recommended for this purpose in some recent works on agriculture, the stables were in the first instance freely strewn with this salt coarsely powdered; but though the ammonia was evolved during the removal of the wetted straw in sufficient quantity to affect even the eyes of the grooms, I could not, after two days' exposure, detect the slightest trace of it in the gypsum when I examined it with slaked lime. This result was the more surprising, as it is known to every chemist that solutions of carbonate of ammonia and of gypsum are incompatible; the carbonic acid leaving the ammonia to form the precipitate carbonate of lime, the sulphuric acid passing to the ammonia; and I had previously ascertained that in an atmosphere so highly charged with ammonia as to be destructive to animal or vegetable life, a very appreciable proportion was taken up by wetted gypsum. The following experiments appeared conclusive upon the point, that under less favourable circumstances not an atom was absorbed:—200 grs. wetted with distilled water were exposed in a close stable for three days, precautions having been taken to avoid any error from evaporation; it was again weighed, no increase could be perceived, nor was any ammonia evolved on the application of the usual tests; while 200 grs. wetted with diluted sulphuric acid, and exposed the same time, were found to have gained 36 grs. of ammonia. The stables were then strewn with the gypsum moistened with sulphuric acid, and examined the next morning; every portion was found to have absorbed sufficient ammonia to evolve its peculiar pungent odour when brought in contact with slaked lime; the stables had also lost their close, unhealthy smell. To use the words of the grooms, they appeared sweetened. As it was evident the gypsum acted merely mechanically, affording a convenient absorbent surface



for the acid, experiments were made, substituting sawdust for gypsum with even more favourable results. That the proportion of free ammonia in stables is very large may be shown by the simple experiment of placing a moistened piece of litmus-paper reddened with weak acid in a stable. In one badly cleaned or ill ventilated the effect is instantaneous; but even in those of Mr. Evans, where the greatest attention was paid to these points, the paper was observed in a few minutes to become blue; even the water kept in the stable the over-night, as is the habit to take off the chill, becomes sufficiently impregnated with ammonia to affect tests. As this alkali is justly ranked among the most powerful stimulants, the continual breathing of an atmosphere vitiated by it can hardly fail to have a prejudicial effect. Grooms are observed to be short-lived; and the rapid course of inflammatory diseases in horses, and their distressing predisposition to colds and affections of the chest, are no doubt greatly aggravated by this cause. The increased salubrity and sweetness of the stable, if pointed out to the grooms, would therefore soon reconcile them to the slight additional trouble the adoption of this remedy would incur. At Dean House the acid gypsum was first strewn amidst the straw; but as this was considered likely to injure the feet and clothing of the hunters, it was afterwards spread on trays. 1 part of sawdust will be found to absorb readily 3 times its weight of acid solution, which I made with 1 part, by measure, of sulphuric acid to 15 of water. If intended to be tried as a manure, it should be mixed in with the straw when removed from the stable. During the process of rotting, the ammonia is evolved so freely, that at the end of two or three weeks, the acid powder, which should not remain more than three days in the stable without changing, will be found completely neutralized; and as the greatest benefit was derived from covering up and salting dung-heaps, by which I believe an additional absorption of ammonia could only have been gained, it may be reasonably hoped that an increased value would result from a manure thus surcharged with ammoniacal salts.—*Journal of the Royal Agricultural Society of England*, vol. iv. p. 278.

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## ANALYTICAL CHEMISTRY.

*On a new Method of Analysing Milk.* By M. HAIDLEN.

THE method recommended by the author for the analysis of milk is based on its coagulation by gypsum, by which all the errors of former methods (especially loss in caseine), in which the milk was dried, and the residue treated with æther and water, or coagulated with acetic acid or alcohol, are avoided. When milk, for instance, is stirred with about one-fifth of its weight of finely pulverized gypsum, and heated to 212° Fahr., it is entirely coagulated; and when the whole is then evaporated to dryness, a brittle mass is obtained, which is very easily reduced to a powder. From this powder the butter may easily be obtained by treatment with



æther; the milk-sugar and soluble salts are then removed with hot alcohol of 0·85 spec. grav., when caseate of lime, together with gypsum, remain undissolved. The alcoholic solution exhibits a scarcely perceptible opakeness with chloride of barium, showing that no error in the result is occasioned by any gypsum being taken up by the alcohol. The following is the plan followed by M. Haidlen in analysing milk:—Burnt gypsum was again combined with its water of crystallization by moistening with water, dried, rubbed to a fine powder, and then dried in the water-bath, until it lost no more in weight. 6·10 grms. of this powder were weighed off in a counterpoised porcelain dish, and 37·8 grms. of fresh cow-milk then poured over it, and coagulated by carefully heating it; the whole was then evaporated to dryness in the water-bath and weighed; the weight of the residue amounted to 11·01 grms., subtracting the gypsum = 6·210, gives the sum of the fixed constituents of the milk = 4·80, or in 100 parts milk = 12·7.

The dried mass was now removed with the greatest care from the dish, which is very easily done, finely pulverized in a warm porcelain mortar, and the powder conveyed into a counterpoised glass flask. After the weight of the powder, = 10·89, had been determined, it was treated with æther as long as this took up any butter, upon which it was dried with the glass flask at 212° Fahr. and weighed, the loss amounted to 1·1 gm. It was now digested with warm alcohol of 0·85, brought on to a weighed filter, and well edulcorated with alcohol. The weight of the residue remaining on the filter, dried at 212° Fahr., amounted to 8·09; the alcohol had consequently extracted 1·7 gm. Since however the entire residue of the milk was not submitted to this treatment, but only a part of it = 10·89, the amount of the fixed constituents of the milk corresponding to the latter had to be found by the following proportion:—

$$11\cdot31 : 10\cdot89 :: 4\cdot8 : 4\cdot69.$$

The weight of the butter = 1·1, and the weight of the milk-sugar = 1·7 subtracted from this 4·69, there remains 2·89 = the weight of the caseine.

100 parts of milk contain therefore—

Butter .....	3·0
Milk-sugar and soluble salts .....	4·6
Caseine and insoluble salts .....	5·1
	<hr/> 12·7

The milk of a woman which M. Haidlen had occasion to examine as to the amount of butter, milk-sugar and caseine contained in it, had a somewhat strong alkaline reaction, and was very difficult to coagulate with gypsum.

No. I., which was of excellent appearance, gave in 100 parts 1·08 residue, which consisted of—

Butter .....	3·4
Milk-sugar .....	4·3
Caseine .....	3·1
	<hr/> 10·8



No. II. indicated by its watery appearance a want of fixed constituents.

100 parts gave 7·2 residue, which contained—

Butter . . . . .	1·3
Milk-sugar . . . . .	3·2
Caseine . . . . .	2·7
	<hr/> 7·2

The soluble salts extracted from the milk by means of alcohol may easily be determined by incineration ; and since their amount is to that of the insoluble salts in the average proportion of 5 to 7, the amount of the latter may at least be found approximately, and the ascertained weights of the milk-sugar and caseine corrected accordingly. But if it is desired to determine the salts with perfect accuracy, it is best to incinerate a weighed quantity of milk, and to analyse the residue.

Two analyses of the ashes obtained from the milk of two different cows gave, for 100 parts milk—

	I.	II.
Phosphate of lime . . . . .	0·231	0·344
Phosphate of magnesia . . . . .	0·042	0·064
Phosphate of peroxide of iron ..	0·007	0·007
Chloride of potassium . . . . .	0·144	0·183
Chloride of sodium . . . . .	0·024	0·034
Soda . . . . .	0·042	0·045
	<hr/> 0·490	<hr/> 0·677

Liebig's *Ann. der Chem. und Pharm.* for March 1843.

*Description of a very simple Process for detecting the Presence of Nitrogen in minute quantities of Organic Substances. By M. LASSAIGNE.*

The presence of nitrogen in organic substances is in general indicated by various reactions, which isolate this body in the gaseous state, by burning the combustible elements with which it was in combination, or by converting it into ammonia, the properties of which are easily recognized.

The methods which chemists are in the habit of using most generally, suffice perfectly in cases where the presence of nitrogen has to be determined in a considerable quantity of organic matter ; but they are impracticable when we have only minute traces of the substance to be examined at our disposal. The process proposed by M. Lassaigue has the advantage of being applicable even in this latter circumstance. It is based on the facility with which cyanuret of potassium is formed, when an organic substance containing even very little nitrogen is calcined at a dark red heat, protected from the atmosphere, with an excess of potassium.

The experiment may be made in a small glass tube of about  $2\frac{1}{2}$  centimetres in length to  $1\frac{1}{2}$  millimetre in diameter. A small piece of potassium, about the size of a grain of millet, is placed at the



bottom of the tube, and the matter to be tested is then added. The end of the tube is heated to a dark red in the flame of a lamp, then left to cool, and the potash salt formed by the calcination dissolved with 4 or 5 drops of distilled water. The decanted liquor is tested with a drop of the sub-sulphate of iron; a dirty greenish precipitate is immediately formed, which, being brought into contact with a drop of hydrochloric acid, becomes of a beautiful dark blue if the matter under examination contains a trace of nitrogen. In the contrary case, the precipitate of the hydrate of the oxide of iron, occasioned by the addition of the protosalt, is entirely redissolved without producing any blue colouring.

The author found that neither caustic potash nor carbonate of potash could be substituted for the potassium in this process. He also states that the method is not applicable when an organic substance is accidentally mixed with a nitrate or an ammoniacal salt. In both cases the potassium acting also on these salts might produce, in the presence of the carbon of the organic substance, a small quantity of cyanuret of potassium.—*Bibliothèque Univ.*, April 1843.

## PHARMACOLOGY.

*On Extracta pneumatica, or Vacuum Extracts.* By Dr. MEURER.

THE names *Extracta pneumatica*, *Extracta frigide parata*, *Extracta lege artis parata*, or *Vacuum extracts*, have been applied by some physicians and apothecaries to the expressed juices of narcotic plants which have been deprived of their water by means of the air-pump, and are brought to the consistence of a pill-mass.

These extracts differ externally from those prepared according to the more usual manner by their beautiful green colour, and by the powerful odour of the herb from which they have been prepared; which however is only evident in the *Extr. conii maculati*, and is not peculiar to the narcotic herbs in general.

The beautiful green colour and the narcotic odour have led to the belief that these preparations contain something in which the active principles of the plants are contained to the utmost extent. There are no other proofs of their efficacy, for no experiments have been made with them on animals or on healthy individuals, nor has the amount of alkaloid contained in them been ascertained.

But to determine the true value of these extracts, and to compare their activeness with those prepared according to the Pharmacopœias, it is perhaps best to point out the differences between the two kinds, and to examine these carefully.

The extracts prepared in vacuum differ from those of the Pharmacopœias of Prussia and Saxony,—1, by their *lively green colour*; 2, by the *strong narcotic smell*, which however is only apparent in *Extr. conii maculati*; 3, by their amount of *vegetable albumen*; and 4, from their *not containing that which is extracted by means of*



*strong alcohol from the expressed herb*\*. We will now enter more fully into the consideration of these points.

With respect to the lively green colour, this evidently proves nothing, for it is owing to a colouring matter, *chlorophylle*, which is peculiar to all plants, and which from its characters belongs to the class of resins, and possesses, as is well known, no peculiar active property. The colouring matter in the spinach and in the yarrow is in this respect identical with that of the hemlock and of the henbane; it can have no influence on the efficacy of the extract. But perhaps it is thought, from the colouring matter being preserved so unaltered, that all the other constituents have remained equally unchanged; but this is decidedly not the case, for Geiger has proved by experiments that the hemlock loses considerably in efficacy even in drying, where no increase of temperature takes place, and where the colouring matter is preserved entirely unchanged†.

We will now pass on to the odour, which is, it is true, far stronger and more powerful in the fresh extracts prepared under the air-pump than in those prepared in the usual manner. But the question now is, what value can be attributed to the smell relatively to the activity? In my opinion a very small one, perhaps none at all. Let us consider, in the first place, the well-known fact that *Oleum amygdalar. Amar. æth.*, *Aqua laurio-cerasi*, *Aqua amygdalar. amar.*, and similar substances, although all the prussic acid, the active principle, has been separated by means of silver or iron, are nevertheless found to be possessed of the peculiar smell of bitter almonds. If, further, we consider the various odours which many substances, for instance the essential oils, possess, notwithstanding their having the same elementary composition, or that the vegetable alkaloids, as for instance morphine, codeine, narcotine, are all without smell, we are naturally led to think that the odour has no connexion whatsoever with the efficacy of the extracts. I am only acquainted with two alkaloids that are possessed of smell, coneine and nicotianine, and here the smell is evidently owing to their being volatile. The smell of narcotic plants appears to me to be only a caution stamped on them by nature to guard us from the poisonous contents of these vegetables.

It is not my intention to prove my assertion merely by the above statement, but by some experiments which I have performed with the greatest care, with the assistance of Professor Prinz‡.

\* Alcohol is now generally used in the preparation of extracts in Germany; its price in this country will however always prevent its employment for this purpose.—ED.

† Experiments with *Conium maculatum*, by M. Geiger, in the 'Magazin für Pharmacie,' by Geiger and Liebig, for 1831.

‡ It might be objected to our experiments, that they are of no value, as those made by Nysten on himself and on animals sufficiently prove the non-efficacy of opium water; but the experiments of Nysten do not entirely agree with those made by Orfila. Neither those of the one however, nor of the other quite satisfied me; in the first place, because both injected the *Aqua opii* into the jugular vein; 2nd, because their experiments were not made on the same individual with *Aqua opii*, and at another time with *Opium*, the only way to arrive at a correct comparison.



The author then gives the details of some experiments made upon dogs, in which  $2\frac{1}{2}$  oz. of recently prepared *Aqua opii*\* were given to a bull-dog, without the least appearance of fatigue or sleepiness being perceptible. The next day the same quantity of opium-water was given to it, but no narcotic effect could be observed. Two days later the same dog was made to swallow a pill of half a scruple of *Opium*; an appearance of dullness now commenced, it still continued to eat, but after  $4\frac{1}{2}$  hours brought up the undigested nutriment with a brown frothy fluid, the dissolved opium. The next day another pill, containing the same quantity of *Opium*, was given to it; it now appeared very dull, lay down the whole day, looked around him with fear, whined, and took but very little food. These appearances continued on the second day, but in a slighter degree; on the third day he was quite cheerful again. With this dog, then, half a drachm of opium produced decided narcotic appearances, which were not observed after administering the *Aqua opii*, which nevertheless corresponded to  $\text{ʒjij}$   $\text{ʒjj}$  of opium.

Similar experiments were now made on a spaniel, and with the same effects. It is quite evident therefore that the odorous principle is not the active one, or that the efficacy of a substance can be ascertained by the smell; for even with the spaniel 15 grs. of *Opium* produced far more effect than 2 oz. of *Aqua opii*, which nevertheless correspond to  $\text{ʒvjij}$  of *Opium purum*.

With regard to the albumen, this substance, whether from plants or animals, is an essential element to the animal frame; but it is only nutritive, and never have the active, and least of all the narcotic effects of the substances from which it has been derived, been observed on its reception†.

This constituent of the vacuum extracts must therefore be termed *useless* and *dilutive*; in my opinion it is even *injurious*, because it absolutely contributes to the spoiling of these inspissated vegetable juices. No one will deny that it does not do this, and those vacuum extracts which have come into my hands prove it distinctly. It is inconceivable how at least this substance was suffered to remain in them, as every practical chemist must have been acquainted with this evil from the older mode of preparing narcotic extracts; and every one must certainly rejoice that the earlier method of preparing the extracts of narcotic herbs has been exchanged for that which is now very generally adopted in this country (Germany).

We have as yet considered only those constituents of the vacuum extracts which are exclusively possessed by them, and which are said to render them preferable; we will now pass on to those which they have not in common with the extracts prepared according to the usual method, and this is the alcoholic extract of the herbs from which the aqueous portion has already been expressed. That,

\* This preparation, which is not known in this country, is obtained by macerating opium in six times its weight of water for 24 hours, and distilling over one part. It is limpid, has a penetrating smell of opium, and is said by some to be possessed of great narcotic power, which however is very doubtful.—Ed.

† Geiger on *Conium maculatum*.



according to the method of preparation admitted into all recent German Pharmacopœias, not only the inactive constituents (the albumen) are removed, but that by treating the expressed residue with alcohol more *active principle* is added, is not to be doubted, and is well substantiated by Geiger's researches.

If we sum up all that has been stated above, it will be evident that the so-called vacuum extracts of narcotic plants are not preferable to those prepared in the usual manner, and that they cannot at all be regarded as an improvement; but are, on the contrary, of *far less efficacy*, even if it were possible to prepare them in sufficient quantity, and if they were not so easily subject to decomposition and to spoil.—*Archiv der Pharm.*, April 1843.

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## CHEMICAL PREPARATIONS.

*On Officinal Extracts.* By F. BALDENIUS.

MR. EDWARD BENTLEY has recently proposed a method of preparing extracts, which, though not exactly new, he most highly recommends as the best. To me it appears to be rather an imitation of the homœopathic essences. Long since several writers have stated, that instead of the officinal extracts, as kept for sale in the apothecary's shop, the fresh juices of the herbs to which spirits have been added should be preserved for use, because they are far more active and less subject to become spoiled; this however is not my opinion, and I think that I have made some observations which prove that the freshly-expressed vegetable juices mixed with alcohol are likewise liable to spoil after some time.

On the appearance of the Saxon Pharmacopœia in 1838, in which some tinctures made with fresh herbs and alcohol were admitted, I was induced to prepare several of them, and took Caspari's Homœopathic Pharmacopœia for a guide.

Fresh wormwood afforded a dark green, scarcely transparent tincture; it was poured into a glass vessel, well-corked and tied down, placed in a dark and cool place in a closed cupboard, and not touched to this day. This tincture is now quite of a light brown colour and transparent; the smell of wormwood has decreased considerably.

Fresh celandine afforded a bright green tincture, which was treated in the same manner and placed aside; the colour has become converted into a bright yellow; it has at present no perceptible smell, but the taste is still somewhat acrid.

Fresh cherry-laurel leaves afforded a perfectly light green tincture, which was kept for the same time; it has now nearly a sulphur yellow colour, and although filtered as the previous ones before being placed aside, it has now deposited a considerable sediment; smell and taste of prussic acid appear to have become more developed.

Fresh henbane afforded a very dark green tincture, which was not transparent; this has kept the best of all. It still has the odour,



but the dark green colour has changed into a blackish-brown, somewhat transparent liquid without sediment. Several others have all undergone some change more or less.

If we were to admit that the fresh juices mixed with alcohol are not at all liable to spoil, then their colours should remain unaltered. It is evident however that some decomposition of the organic substances must have taken place.

But to return to the active properties of these spirituous juices, no accounts of any favourable results have hitherto been published. I am moreover of opinion that they never will replace in activeness the extracts prepared according to the new method. An extract prepared with care will never fail in its action; the physician knows the dose he wishes to prescribe for his patients, but not so of the vegetable juices. The effects of several extracts are well known to be specific, for instance of *Extr. hyoscyami*; it is sedative and antispasmodic; or is it thought that we shall be able to accomplish wonders with the fresh juices?

There are some zealous persons who enter the field against all that is artificial, and fancy that in the application of heat in the preparation of medicines all the healing power is destroyed. Why, I would ask them, are boiled potatoes more nutritive than raw ones? Before we reject what is old we should test that which is new.—*Arch. der Pharm.*, April 1843.

#### *Preparation of Bromide of Iron.*

*Rx Limaturæ Ferri ℥j., immitte in vitrum bene claudendum, adde Aquæ destillatæ ℥jjj-℥jv., tum sensim adjice Bromi ℥j. et vas bene clausum interdumque agitandum seponere, donec liquor colorem subviridem induerit. Filtra et liquorem limpidum cito evaporatione ad siccitatem redige.*

The bromide of iron has a brick-red colour, deliquesces when exposed to the atmosphere, dissolves easily in water, and has a very styptic taste.—Geiger and Mohr's *Pharm. Universalis*.

#### *Perchloride of Mercury in Cutaneous Diseases.*

The best form of employment is, according to Plisson, in that of thick bands of paper which have been immersed in a dilute solution of corrosive sublimate (from 10 to 50 centigrms. in 600 distilled water), and the same quantity of chloride of potassium dissolved in as little alcohol as possible—*L'Expérience*, 1843, No. 296.

#### *Pearson's Arsenical Solution, Aqua arsenicalis Pearsonii, Liquor natri arsenici.*

This solution is prepared in the following manner:—100 parts nitrate of soda are carefully mixed with 116 parts arsenious acid (white arsenic); the mixture is exposed in a hessian crucible to a red heat, and the residue now treated with water. A solution of



carbonate of soda is then added to the liquid until this indicates a decided alkaline reaction, upon which it is evaporated and exposed to the cold to crystallize. When the mother-ley is not alkaline, a fresh portion of carbonate of soda is added to it, and it is again left to crystallize.

This preparation, which is obtained in six-sided prisms, has an alkaline reaction. It contains 29·26 per cent. arsenic acid, which corresponds to 19·1 per cent. metallic arsenic. A filtered solution of this arseniate of one grain to one ounce of distilled water gives the *Aqua arsenicalis Pearsonii*.—Mohr's *Pharmacop. Universalis*.

*Purple of Cassius, Mineral Purple, Aurum stanno paratum.*

This preparation, which is used in the arts as a colour, and is employed as a medicine by French physicians, is best obtained, according to the French Pharmacopœia, in the following manner:—

10 parts of acid chloride of gold are dissolved in 2000 parts of distilled water. In another vessel, 10 parts of pure tin are dissolved in 10 parts of nitric acid and 20 parts of muriatic acid, and this solution diluted with 1000 parts of distilled water. The solution of tin is then added by degrees to that of the acid chloride of gold, until no further precipitate is formed. The precipitate is allowed to subside, and is washed by decantation; it is then filtered, and the purple precipitate dried at a very gentle heat.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the Cool Sweating Process in Tanning.*

It is a matter of much regret, that, at this moment, when every other art and manufacture has been benefited by the discoveries of science, the manufacture of leather seems to stand, to a great extent, unimproved and unchanged by the progress made in chemistry, and uninfluenced by the rapid march of other branches of art towards perfection. Old modes of procedure have in every other department of the producing interest been discarded, and the entire processes revolutionized by the light thrown upon them from the discoveries in chemical and mechanical science. Though the investigating chemist has endeavoured to improve the mode of manufacture, and much light has been shed upon that part of the process which he has examined, yet the tanner has done little or nothing to aid his investigations, being too generally content to follow the practices of his fathers, often erroneous and founded upon false theory, or a mere hap-hazard method. It is true that, in the mechanical processes, much improvement has been made upon the modes practised by our forefathers. We may trace them from early antiquity, when the flail served to break the rough bark for soaking in the pit, down through the stone crushing and breaking by its revolution the bark



beneath it, to the adoption of the cast-iron mill propelled by steam, by water, or other powerful agent. The application of steam has been thought by some to aid materially in the extraction of the tannin; but that this is true, or that tanning with warm liquors, or with liquors containing tannin thus extracted, improves the quality of the leather, admits of a doubt. To these may be added various kinds and descriptions of reels, rolling machines, and other modes of lessening labour and expense, to describe all which, with the numerous attempted improvements, would require a volume. But it appears that these are all mere mechanical improvements, highly valuable it is true as far as they go, originating in the desire of the tanner to lessen those expenses which were more obvious to his understanding than the equally important losses which he was sustaining by erroneous processes in the chemical department of his operations.

Of the tanning, properly so called, it is not our purpose at present to speak, but we will confine our attention to that part of the process connected with the preparation of the hide for combining most advantageously with the tannin; we allude to the liming and bating, or the unhairing and cleansing, preparatory to its introduction to the liquor, which is a solution of the tanning principle. The mode extensively used in England, upon the continent, and in the United States, is that of steeping the hides in a solution, or more properly a milk of lime, in which they are allowed to remain from one to three or more weeks, according to the state of the weather and the texture of the hide, until they present the appearance which experience has taught is proof of the proper action of the lime. This has the effect to loosen the hair and epidermis of the skin, and render it easily removable by the after-rubbing-down, by means of a knife, upon a beam or block. Another mode of producing the same result is that of suspending the hides in a close chamber, heated a little above the ordinary temperature of the atmosphere by a smouldering fire. In this case the epidermis becomes loosened by incipient putrefaction. A so-called sweating process is in use in Germany, and by some applied in this country; but it, as well as the preceding, is attended with much risk—so much so as to preclude their extensive adoption. By the last the hides are laid in a pack or pile, and covered with tan, or other imperfect conductor of heat, in order to confine the heat generated by the spontaneous decomposition of the gelatine, or other substance of the skin, and roots of the hair.

To the investigation of this very important part of the tanning process chemists seem to have given little or no attention, and the practical workman has derived from them no insight into the true nature of the operation, and consequently has not improved it to that extent which is desirable. The action of lime upon the texture of the skin, so far as the loosening of the hair is concerned, is not involved in much obscurity; but the other changes effected upon the hide, which remain permanent, and influence to a considerable extent the quality of the leather, have never been satisfactorily explained. Neither have chemists yet been able to give any satis-



factory elucidation of the mode of operation of the bate (as technically termed), which consists of a solution of the muriates of ammonia and soda, &c., from the excrements of pigeons and domestic fowls. That the muriates are decomposed by, and combine with the lime, rendering it more soluble, is most probably the true explanation of that part of the process; but how the fermentation produced affects the quality of the leather is not clear, unless we suppose that a large portion of the gelatine and albumen of the hide is removed. Though this is highly probable, yet we believe it is not generally admitted by tanners.

The Hon. Gideon Lee, in his lectures on tanning, remarks, "I believe much of the original gelatine of our hides is never combined with the tannin, but is wasted, actually extinguished or incapacitated, or perhaps both, in the process of the manufacture; for I have not a doubt that, if it were possible to bring every particle of hide, the moment it is prepared for the handler, into conjunction with the tannin, as chemists are able to do with the solutions of both, the results would give nearly 200 lbs. (probably 180 lbs.) of leather from 100 lbs. of perfectly dry hide when cleansed from all extraneous appendages." "But, as this is impracticable—as we must retain the original organic form of the hide in order to make leather of it—it becomes our business to devise and adopt such saving modes of process as will waste the least and save the greatest quantity of the gelatinous substance of the hide." No doubt, a vast saving of the gelatinous parts, and consequently a much increased amount of leather, might be made by adopting new modes of preparing the hides for the liquors. Further, we can say with confidence, that such saving has been made, and the quantity of leather produced has very nearly approached that which chemists consider the greatest amount possible. "Saving," he truly remarks, "should be the order of the day," and we may add, that he who, by the application of scientific principles to the manufacture of leather, should thereby add to the value of the article produced, and consequently to the general comfort and wealth, should justly be considered a benefactor to his country. When we consider the immense amount which has been annually lost for ages, for all practicable purposes, we are appalled at the sum, and our surprise increases that tanners have not busied themselves to lessen this immense drain upon their profits.

Among the evils of the old process may be enumerated that which arose from the energetic action of the agents made use of, and the extreme caution necessary to be observed in their application. By this process, still extensively used, the dry hides are subjected to the operation of the fulling stocks, which, by their powerful action upon the fibres, soften and extend their particles, causing them to move on each other, and, we believe, if long continued, opening the pores and removing a considerable portion of the soluble matter of the hide, causing that "softness, limberness and thinness," which is sometimes complained of in leather which has been otherwise well managed. A certain degree of softness appears to be absolutely



necessary for the proper action of the lime and bate, and for the just incorporation of the tannin with the hide. Against the liming process a strong objection may be brought, in its injurious action upon the particles of gelatine and albumen of the hide. That a substance so powerful in its affinities, and capable of decomposing so rapidly most animal matter, should act with injurious effects upon the moist, porous substance of the softened hide, can scarcely be doubted by any who have had any practical experience on the subject. The effects this agent produces in expanding and stretching the fibres of the hide, thereby drawing them from their original position, and consequently weakening their texture, must be obvious, "swelling, as it does, the body of the hide to double its original thickness." "Every tanner knows that high-limed leather is loose, weighs light, and wears out quickly;" and may we not, with much probability, suppose that its injurious effects are produced in a proportionate degree by the "low-liming process?"

The evils resulting from the use of this agent are doubtless to be ascribed to its decomposing the albuminous and gelatinous parts, and that thereby an amount of these substances is destroyed of which we can form no adequate idea. Not only does the tanner thus lose those parts which would have combined and formed leather, but that which is formed is rendered less valuable, owing to its decreased solidity, toughness and porosity.

Without doubt, the injurious effects produced by liming are increased and heightened by the after process of bating, which is intended to extract the lime and bring down the skin to its original thickness by soaking or drenching, as before alluded to. The muriates, &c. in solution, which render the lime more soluble, and thus easily removed, carry off a portion of the glue, &c., and the fermentation induced by the decomposition of the animal matters of the bate also materially assists in the destruction of these easily decomposed components of the hide. That a fermentation takes place is proved by the rapid action of the bate in destroying the grain side of the skin or hide during the warm days of summer, if not properly attended to, and suffered to proceed too far. Another objection, which should not be passed over, lies in the extremely unpleasant scent, arising from the putrefaction of animal matter, which is inseparably attached to the clothing and persons of the workmen engaged in this branch of the business.

The evils arising from the old, and still practised, methods being thus made sufficiently apparent to the understanding of every practical man who has not already appreciated them and learned from sad experience their reality, we are prepared for the reception of a process which, to a great extent, in the estimation of those who have applied it, removes the difficulties under which the tanner has laboured. This is that which has been erroneously denominated the "cool sweating process for unhairing hides and skins," in contradistinction to that which is practised in Europe, and to some extent in this country, and is called the "warm sweating," and which has been before described. It will be remembered that the effects pro-



duced by the latter method, in loosening the hair, are due to the putrefaction engendered by their being placed in piles or exposed to artificial heat, and that these are attended with much risk.

The so-called "cool sweating process," and apparatus made use of, are thus described. First, a vault or pit should be prepared for the reception of the hides, which, for convenience sake, should be 12 feet long, 12 feet deep, and 10 feet wide. The walls may be built of stone, or a frame, and planked. There should be an alley or vestibule, for entrance, not less than 6 feet long, having a door at each end, the outer one made double, and filled in with tan, to prevent the communication of warm dry air from without. A ventiduct, made of plank, 10 or 12 inches square, should extend from the centre of the bottom of the vaults, 3 or 4 rods therefrom, and placed not less than 4 feet below the surface of the ground. This serves both as a drain for discharging the water of the vault, and to admit damp, cool air to supply the place of that which has become rarefied, and thus keep up a current through the ventilator at top. The ridge of the roof may be level with the surface of the ground; on the ridge, and extending its whole length, set up two planks edgewise, 2 inches apart. The space between these is to be left open, but cover the remainder of the roof with earth to the depth of not less than 3 feet. The covering of earth upon the vault and drain is to preserve a low temperature for the hides, so that they may unhair without tainting. Spring water should be conducted, either in pipes or logs, around the angles formed by the ceiling with the walls of the vault, from which water should be allowed to flow in small quantities, either forming a spray, or falling so as to raise a mist or vapour, and saturate the atmosphere of the vault. The temperature of spring water is generally about  $50^{\circ}$  Fahr. Water evaporating at all temperatures, it is plain that, if a constant supply be afforded, this evaporation, by requiring a large portion of heat, would keep the temperature of the vault nearly uniform. To suspend the hides in the pit, place three bars lengthwise at equal distances near the ceiling, with iron hooks 2 or 3 inches apart inserted therein. Soak the hides as usual for breaking, then hang them singly upon the hooks by the butt, spreading them fully open. In the course of a few days, when the hair begins to loosen upon the upper parts, take them down, raise the middle bar, and hang them by the other end until they will easily unhair. The hides should not be broken until they are taken from the vault, and ready to unhair. In a good vault, where the thermometer ranges from  $44^{\circ}$  to  $56^{\circ}$  Fahr., which it should never exceed, and where there is a free circulation of *damp* air, hides generally require for unhairing from 6 to 12 days. When the temperature falls below  $44^{\circ}$ , the ventilator should be partially closed; and when it rises above  $56^{\circ}$ , *cold damp* air must be forced in, or an increased quantity of cold spring water may be thrown from a hose, or otherwise.

If this process is properly and carefully conducted, hides will be received by the tanner from the beamsman's hands free from all extraneous matter, and retaining nearly all their gelatine or glue,



with the albuminous and fibrous matter of the organized hide. The action of the agents employed in the cool sweating process appears to be confined to the *surface* or *grain* of the skin, expanding the outer portion and softening the roots of the hair, thus rendering their extraction more easily effected. In opposition to some who, without due examination, have pronounced this a putrefactive process, and consider it as differing in no important particular from that formerly made use of, and which was attended with such imminent risk, we, after considerable experience and investigation, are brought to the conclusion, that the effect produced by what is called the "cool sweating process," is due to the *softening* action of the vapour, and that it is a simple case of absorption and swelling of the tissues of the skin and roots of the hair. Various circumstances combine to strengthen us in this opinion, the most obvious of which are the following, viz.:—We believe it to be the opinion among chemists, that the putrefactive fermentation, or that which is vulgarly called tainting, is always attended by the formation of ammonia (spts. hartshorn, a substance readily perceived by the senses), and that when this cannot be recognized in the vault or chamber in which the process is conducted, we are warranted in supposing it is not produced, and that consequently this fermentation does not take place. That the action of the vapour is confined to the surface of the hide, is proved by its increased weight when prepared by this process over that by liming, and the consequent gain of leather; for whereas, by the old liming method, 30 to 40 per cent. gain upon the original weight of the dry hide was considered a good increase, now by the cool sweating a gain of from 50 to 70, and even 80 per cent. is often obtained; thus showing incontestably that a great amount of the softer portions of the hide, which were formerly lost, are now retained within it by this method of unhairing. This result would not to the same extent be produced if the process was putrefactive, as thereby much of the substance must be removed, or brought into a condition to be acted upon by the solvents to which they are subjected. We may add, that those chemists who have attentively examined it, have pronounced it a simple case of absorption and softening.

The advantages which this process presents must be apparent to the understanding of every unprejudiced practical tanner, who is at the same time acquainted with the chemical nature of the action of the substances used in his art. To the tanner, who believes that all the *glue* must be extracted from the hide in order to make good leather, this method would appear erroneous; but who that has any knowledge of the composition of leather so supposes? or who would consider the objection of such as worthy of regard?

The continuance of this method, where once adopted, is the best proof of its utility, and that it realizes in practice all that was expected of it. It is practised almost universally in the large tanneries of New York, Maine, New Hampshire, and, to some extent, in Northern Pennsylvania.—From the *Journal of the Franklin Institute* for February 1843.



*On a new Method of manufacturing White Lead without endangering the Health of the Workmen. By M. GANNAL.*

The author concludes his memoir by stating his process of manufacture to consist—1, in granulating the lead; 2, in reducing the size of these grains indefinitely by friction on themselves in a cylinder of lead; 3, in facilitating the process of oxidation by the introduction of atmospheric air; 4, by immediately carbonating this oxide of lead by the employment of air charged with carbonic acid; 5, in introducing nitric acid or nitrate of lead into the apparatus to hasten the oxidation; 6, in washing the product; 7, in submitting the results to the greatest pressure possible, to hasten its drying; 8, in dividing the pressed mass into square cakes; 9, in drying the divided product in a stove by a current of heated air.—*Comptes Rendus.*

PROCEEDINGS OF SOCIETIES.

*Chemical Society of London.*

May 16th, 1843. (Arthur Aikin, Esq., President, in the Chair.)  
The following communications were read:—

“On the Composition of an Acid Oxide of Iron (Ferric Acid),”  
by J. Denham Smith.

The author, after alluding to his discovery of ferric acid in the September of 1841, without any previous knowledge of the labours of M. Fremy\*, and rejecting the idea of any claim of his own to priority of discovery, proceeds to detail the numerous experiments which he had made on this subject. The process employed and preferred for its production consists in igniting at a full red heat pure and finely-divided oxide of iron with four times its weight of dried nitre, in a covered crucible for about an hour. When well-prepared it has the appearance of a dark reddish-brown porous mass, very deliquescent, and which should be powdered while warm, and transferred to a well-stoppered bottle. Its solution should be made with ice-cold water to retard its decomposition. It has an amethystine tint, but so deep as to appear opaque except at the edges. It gradually decomposes, evolving oxygen gas, and depositing sesquioxide of iron; a temperature of  $212^{\circ}$  effects this completely, and the solution remains colourless. Sulphuric and nitric acids evolve oxygen; hydrochloric acid; chlorine, oxalic acid, carbonic acid gas mixed with oxygen. Salts of barytes throw down a voluminous crimson-red precipitate. Mr. Smith then details a series of preliminary experiments to ascertain the best means of analysis, and adopts its decomposition by boiling and the estimation of the sesquioxide of iron and oxygen gas thus obtained; the mean of a number of analyses gives the composition 28.0 iron and 22.27 oxygen, being an approximation sufficient to justify the adoption of the formula  $\text{FeO}^3$  as representing ferric acid; and this is confirmed by the analysis of the barytes salt, which yielded as a mean 19.56 barytes, 11.64 sesquioxide of iron, 3.35 oxygen, and 2.31 water, or  $\text{BaO}, \text{FeO}^3 + \text{HO}$ .

\* See observations on this acid at pp. 337 and 393.



The decomposition of this acid by contact with organic matter rendered the separation of floating particles difficult of execution. The author considers the existence of another acid oxide of iron certain, the combination of which with potash or soda forms beautiful emerald-green solutions, and which probably contains less oxygen than the ferric acid. It often accompanies the red salts, into which it is rapidly converted by chlorine. Mr. Smith hopes, during the recess of the Society, to complete the investigation of this compound.

“On the Action of Alkalies on Wax,” by Messrs. Warrington and Francis.

After reviewing the communications and discussions relative to the formation of fat in the animal body which had transpired in the French Academy of Sciences during the last six months, the authors enter on the examination of wax, in respect to its conversion into fat acids, as recently stated by M. Lewy†. The action of the alkalies on this body, and the separation and purification of the resulting compound were then described. The substance separated by acids from the solution of the saponified mass obtained by fusing wax with caustic potash was found, when perfectly pure, to possess no acid reaction on litmus paper, or with solution of carbonate of soda; its melting point was constant at 74° Cent., and not the slightest appearance of crystalline structure was evident on the cooling of the melted mass, differing therefore decidedly in properties and characters from stearic acid. On submitting it to analysis with chromate of lead, it yielded in 100 parts 80.31 C, 13.70 H, 5.99 O, while stearic acid, according to Liebig and Redtenbacher, is composed of 76.69 C, 12.70 H, 10.61 O. The analogy in composition of this substance with ceraine, as obtained in the analysis of Ettling, is then pointed out, the latter body consisting in 100 parts of 80.44 C, 13.75 H, 5.81 O.

It is not only closely allied to ceraine in composition, but also in many of its properties, from which it differs however in its melting point, ceraine becoming liquid at 70° Cent., in being far more soluble in hot alcohol, from which it separates in a crystalline state, and in forming combinations with alkalies somewhat analogous to soaps. From its isomerism with ceraine and its resemblance to that body in many of its properties, the name of *pseudoceraine* is proposed for it until the subject, as promised by the authors, is more fully investigated.

“On the Action of Oil of Vitriol upon Ferrocyanide of Potassium,” by Mr. Fownes.

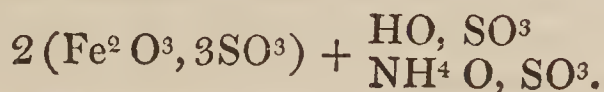
By the action of concentrated sulphuric acid upon yellow ferrocyanide of potassium the latter is resolved into carbonic oxide, ammonia, potash and protoxide of iron, the oxidizing agent being the water set free from the oil of vitriol and that contained in the crystals of ferrocyanide. The carbonic oxide so produced is perfectly pure, furnishing when exploded with oxygen a volume of carbonic acid equal to its own.

† See the last Number of this Journal, p. 402.



If the residue in the flask or retort be strongly heated after the carbonic oxide has ceased to be disengaged, the odour of sulphurous acid becomes perceptible, and at the same time a crystalline substance is observed to separate from the hot liquid, which increases in quantity until the bottom of the vessel becomes covered to some depth. On cooling, the acid may be poured off, and the white crystalline matter washed out with water and collected on a filter.

This substance, on examination, proves to be iron-alum in an anhydrous state. It is formed by the peroxidation of the protoxide of iron at the expense of a portion of the acid; hence the evolution of sulphurous acid. It contains both potash and ammonia, and is represented by the formula



This iron-alum is apparently the type of a number of anhydrous sulphates, which may be obtained by similar means, for example, sulphates of copper, nickel, nickel and potash, &c. Such compounds are for the most part altered by contact with water.

The experiment described will probably afford the best method of preparing carbonic oxide for all purposes.  $\frac{1}{2}$  oz. of the yellow salt gives more than 300 cubic inches of pure gas.

### *Meeting of the Royal Institution.*

Friday, June 9, 1843.

The lecture was by Professor Faraday, on the "Electricity of Steam." The Professor commenced his lecture by illustrating the extent of our knowledge of the electricity which accompanies the formation of steam previous to the observations about to be detailed, showing that when water is poured into a heated metal cup electricity was set free; and that if the vessel, into which the water was placed, was above a certain elevated temperature, no electricity was evolved in consequence of the water being prevented from contact with the containing vessel by a stratum of steam. The Professor then detailed the first observations made at Newcastle by one of the workmen in attendance on a boiler belonging to the Newcastle and Carlisle Railway, and whose report, that the boiler was full of fire, from the fact that when he placed his hand near it an electric spark was communicated, drew the attention of Mr. Armstrong to the subject, the result of whose investigations were then given. A boiler having been arranged for the purpose of illustrating this subject, the Professor exhibited the production of the spark during the emission of the steam, and showed most conclusively that the boiler and appendages were charged with negative electricity, while the issuing steam was in the opposite or positive state; that it was necessary that the boiler should be insulated; that the steam should issue through a small aperture; that the material of which this aperture was constructed modified materially the quantity of electricity, wood and the metals having been found by experiment to be the best fitted for the purpose; that the introduction of a small portion of



saline matter, as sulphate of soda, into the exit chamber prevented entirely the elimination of electricity, and even when common water was introduced it had the same effect; that by long continuance of the issuing current of steam, electricity was gradually developed, from the condensed steam displacing and driving out the saline matter, pure water being a necessary element for its production; and that the whole phenomena arose from the rubbing of the condensed water against the tube from which the steam was issuing. The Professor also proved that the introduction of ammonia reversed the electrical states, what was before negative becoming positive, and that as the ammonia was expelled the original states were gradually restored; that turpentine and acids acted in the same way as saline substances, from their enveloping the particles of water in a film of their own substance. The lecturer considered, from these facts, that the view advocated by Mr. Armstrong, that the electricity arose from the passage of water into the aeriform state, was not tenable, and that the thunder-cloud and the lightning's flash could not be attributed to this origin.

The library table was rich in many beautiful chemical products sent for exhibition.

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## PATENTS.

*Patent granted to Antoine Blanc, Paris, and Theophile Gervais Bazille, Rouen, for Improvements in the manufacturing or producing Soda and other Articles obtained by or from the Decomposition of common Salt or Chloride of Sodium.*

THIS improved process consists in decomposing sea-salt by silica and water under the influence of a strong heat. The action of silica on sea-salt, under the influence of water and heat, is a fact which has been long known in chemical science, but hitherto no application has been made of it, upon a large scale, in the arts for the manufacture of soda.

When in the laboratory an intimate mixture is made of sea-salt and sand, and when that mixture is exposed to the action of a cherry-red heat in a large porcelain tube, a decomposition of the mass takes place, when the vapour of water is made to pass over it, and there results a neutral silicate of soda, insoluble in water, while hydrochloric or muriatic acid is disengaged, and may be received or condensed in water. The vapour of water, in decomposing, transforms the mass into a proportion, more or less considerable, of silicate of soda: at the extremity of the porcelain tube, a tube of glass may be adapted, destined to conduct the acid gas into a vessel full of distilled water. After some hours of ignition the liquor becomes strongly acid, and this liquid muriatic acid is not coloured in the least yellow, as the acid of commerce usually is by the presence of iron.



The mass withdrawn from the tube is to be lixiviated, to carry off all the undecomposed sea-salt, and the remainder is to be mixed with a little carbonate of soda. This mixture being fused in a crucible forms a vitrified mass, consisting of a subsilicate of soda, soluble in water. The subsalt is to be dissolved in water, and transformed into carbonate of soda and gelatinous silica as follows:— A stream of carbonic acid gas is passed through the solution, whereby white flakes of silica are deposited, and there remains in solution only carbonate of soda, which may be evaporated and calcined, and disposed of as dry soda or soda-ash, or formed into crystals. Upon a large scale, the transformation of sea-salt into neutral silicate of soda may be conveniently performed as follows:— The calcination of sea-salt and siliceous sand may be made in cast-iron cylinders, placed in furnaces, so that the flame may pass around them and raise them to a cherry-red heat. The arrangement of these cylinders may be the same as those of gas retorts. The axis of each cylinder is occupied by a large tube of the same length as the cylinder, which tube is pierced with a multitude of holes; this tube is inserted at one end of each cylinder, and into the other end of each cylinder a large porcelain, stone-ware or glass tube is adapted, through which the muriatic gas is allowed to pass off. Each cylinder is to be filled loosely, by very moderate pressure, with an intimate mixture of sea-salt and sand; and when the mass has arrived at a cherry-red heat, the steam of water is made to pass from a steam-boiler into the perforated tube which traverses the cylinder. For the due success of the operation, the workman charged with its management should allow the steam to pass very slowly and equally into the tube; for if too much steam were introduced into the tube, the iron cylinder might be forcibly expanded and lose its shape; in fact, the steam should not be admitted so quickly as to lower the temperature of the mixture beneath a cherry-red heat. When this is attended to, the water is decomposed in the apparatus, and the transformation of sea-salt and sand into neutral silicate of soda, goes on without risk and in a complete manner.

The proportions of the materials to be employed to obtain a good decomposition, are sea-salt 280 parts, and sand 200 parts.

As muriatic or hydrochloric acid has a certain value in commerce, and as in certain localities large quantities are employed, especially for the manufacture of chlorine, it is frequently important to collect this gas instead of allowing it to pass off by the chimney. The tube adapted to the cylinder for the disengagement of the acid gas should be very large, especially at its orifice, for otherwise it might be choked up by volatilized sea-salt. The tube that carries off the gas is to enter first of all into a large empty chamber, into which the volatilized salt may be condensed and deposited. This chamber is to communicate with a large cistern of wood or stone, having its bottom covered with water. By this arrangement, and by employing sufficiently large vessels, the acid gas may be collected with little or no pressure, while the apparatus of Woulfe, usually employed in the



preparation of muriatic acid, requires a series of 20 or 30 bottles, and considerable pressure.

Before proceeding to the transformation of the neutral silicate into subsilicate, the mass is to be lixiviated, as above stated, in order to extract the undecomposed portion of sea-salt. The neutral silicate of soda, obtained in this first operation, being insoluble, it must be rendered a soluble subsalt by combining it with an additional proportion of soda; 60 parts of carbonate of soda must be employed to convert 100 parts of neutral silicate into subsilicate of soda. There is however no inconvenience in employing a little excess of carbonate, as this salt is not liable to be decomposed by heat, and remains always in the solution. The apparatus destined to calcine this mixture is either an ordinary reverberatory furnace, or a large Hessian crucible. At a cherry-red heat the vitrification takes place, and the matter in this state is soluble in hot water. The insoluble silicate however may be employed in the manufacture of glass, with suitable additions of lime and alumina.

The vitrified subsilicate of soda ought to be pulverized and thrown into hot water to effect its solution. This solution may be made in large wooden or stone reservoirs.

The process adopted by the patentee for obtaining carbonic acid, consists in extracting it from limestone by calcination in continuously acting lime-kilns. To the lime-kiln a dome-top is adapted, furnished with a tube that passes into the vessels or vessel containing the solution of subsilicate. The subsilicate of soda is decomposed in this operation, carbonate of soda being formed, which remains in solution, and gelatinous silica being deposited; the operation is finished whenever the carbonic acid ceases to be absorbed by the solution. This silicic acid may be obtained as a white jelly when the carbonic acid is free from smoke, in which state it is well adapted for the manufacture of fine glass. Care must be taken not to employ too great a number of vessels in effecting the transformation of subsilicate of soda into carbonate, because in that case the pressure would be too considerable, and would obstruct the flow of air through the lime-kiln, and the proper calcination of the lime.

With this view the patentees prefer employing a single vessel of very large capacity, as the operation goes on perfectly well, and the draught of the furnace is sufficiently great to maintain uninterrupted combustion to the end of the process.—Sealed Feb. 12, 1840.

*Patent granted to Julius Bordier, Austin Friars, London, for certain Improvements in preparing Skins and Hides, and in converting them into Leather.*

This invention consists in a novel mode of conducting the process of tanning, and in the employment of certain mixtures or compositions in place of the ordinary tanning liquid, by which means a very considerable economy in time, labour, and cost of material is effected; and another advantage resulting from this invention is, that skins or hides, prepared in the manner hereafter described, are rendered im-



permeable, or nearly so, to water; and further, the cuttings and parings of skins and hides dressed in this manner, and also the leather itself, after being used for various operations, may be applied to other useful purposes, whilst the cuttings and parings of skins and hides prepared in the old manner would be perfectly useless.

The skins and hides, after having undergone the operations of washing, removing the hair and swelling, are submitted to the action of such metallic, saline and earthy substances as may be decomposed by the skins and hides, or may combine with the same. Among these substances, the one that seems preferable is the bibasic sulphate of sesquioxide of iron, or the basic red sulphate of iron, or the subsulphate of peroxide of iron.

The basic red sulphate is prepared by boiling  $15\frac{1}{4}$  gallons imperial of water in a copper boiler, and dissolving therein 2 cwt. of green copperas (protosulphate of iron) in the following manner:—The copperas is pounded by beaters, and passed through a sieve, with apertures of about 1 inch square, and then the above quantity of pounded copperas is gradually introduced into the  $15\frac{1}{4}$  gallons of water, the bottom of the boiler being stirred and the ebullition being kept up. When the whole of the copperas is dissolved and the liquor boiling, it is poured into a deal tub or vat of the capacity of about 44 gallons, but not very deep, and to it about 44 lbs. of sulphuric acid, concentrated at  $66^{\circ}$ , or spec. grav. 1.848, are added; the mixture is then agitated, and about 44 lbs. of finely pulverized peroxide of manganese are added by degrees. The agitation is continued until the swelling has ceased, and is repeated at intervals until the mixture is cold; when cold, it is lowered to the degree required by the addition of water.

Instead of using sulphuric acid at  $66^{\circ}$ , the 2 cwt. of copperas may be dissolved in a mixture of 66 lbs. avoirdupois of non-concentrated sulphuric acid at  $50^{\circ}$ , or spec. grav. 1.530, and 132 lbs. of water; but then the dissolution must be effected in a boiler made of lead, in order to resist the action of boiling sulphuric acid. This process may be also conducted in the following manner:—Pound the green copperas, sift through a sieve with holes of about one-third of an inch square; take 22 lbs. of this copperas, put it in a great stone jar, and add thereto a mixture of  $2\frac{1}{4}$  lbs. of nitric acid at  $36^{\circ}$ , or spec. grav. 1.333, and about 3 lbs. 1 oz. of sulphuric acid at  $66^{\circ}$ , or spec. grav. 1.848. Agitate with a wooden spatula, heat the jar by steam, continuing the agitation until the cessation of nitrous vapours, and the complete dissolution of the copperas take place; remove the jar, and continue to stir the mixture from time to time until it coagulates into a paste, or at least until it is perfectly cold; let it rest for about 24 hours; add to it water, and mix it carefully; pour in a sufficient quantity of water to bring the mixture to the degree in which it ought to be for use; add then to it a sufficient quantity or excess of hydrate of peroxide of iron, recently prepared; agitate the liquor well every 2 hours during 2 or 3 days, and then it may be employed for the preparation of skins and hides.

The yellow precipitate, obtained when the liquor is prepared by



the first process, may be employed, instead of the hydrate of peroxide of iron, to finish the preparation of the liquor last described. This precipitate may moreover be easily converted into a solution of bibasic sulphate of red oxide of iron, by adding to it, when in a pasty state, a sufficient quantity of concentrated sulphuric acid; the mixture becomes very much heated, all the basic salt is dissolved, and when cold the liquor is brought to the proper density by diluting it with water; and enough of the yellow precipitate, or of hydrate of peroxide of iron, is added to render it as much basic as possible. The mixture, after being stirred at intervals for two or three days, is allowed to settle, and the liquor thus obtained may be immediately used for the preparation of skins and hides. The liquor from which the skins and hides have extracted all the bibasic sulphate of sesquioxide (red oxide) of iron, and which contains only sulphate of manganese and a little protosulphate of iron, may be decomposed either by milk of lime or magnesia, or caustic or carbonated soda; by which means colours of various hues are produced, and also saline substances, of low price, as chemical products, for which there is a daily demand.

From these various compositions results a reddish liquor, which is to be lowered down to the proper density by the addition of water; and in it the skins and hides are immersed, after having been washed, swollen, and freed from hair by the ordinary processes. The skin and hides are immersed in the liquor for periods varying according to their thickness (thus three days will suffice for thin skins, such as calf skins, while ox skins will require from six to eight days), and when removed from it are completely imputrescible, but they are as permeable to water as the leather tanned by ordinary processes.

The currier's process, and other known means of rendering the leather impermeable, must now be employed to give to the skins prepared as above stated what they still want, namely, the proper degree of tenacity, solidity, and impermeability.

Thus in fifteen or twenty days, or even if necessary in a shorter space of time, leather of all kinds may be obtained, and especially thick leather for soles of shoes and boots, which is more durable than that produced by the ordinary means.

The skins thus prepared have besides this advantage, that when worn out by use they may be easily freed from the basic salts and the fatty substances which render them imputrescible and impermeable, and may then be used for the making of glue, as is now done with the parings and cuttings of raw skins and hides before they are tanned.

In conclusion, the patentee claims the preparation and application of the above-mentioned combination of chemicals to the preparation of skins and hides, in the place of the tanning liquor heretofore employed.—Sealed Jan. 13, 1842.



# THE CHEMICAL GAZETTE

No. XVII.—July 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*Examination of the Bark of the Cork-tree (Quercus Suber).*  
By M. O. DÖPPING.

WHEN cork, reduced to a powder by means of a file, is submitted to the action of æther, a wine-yellow solution is obtained, from which, on evaporation or distillation, a yellowish-white crystalline substance separates, which appears to be related to the varieties of wax. Strong alcohol also extracts it from the cork; it is Chevreul's cerine. When the greater portion of the alcohol has been removed by distillation from the spirituous extract of the cork, the cerine separates in acicular yellow-coloured crystals from the brown liquid residue. It may be obtained pure by repeated crystallization from alcohol or æther, and its colour is then pale yellow. The brown liquid from which the cerine separated, forms, when further evaporated, a brownish extract, the chief constituents of which are extractive matter and tannic acid; it reddens blue litmus paper.

When the bark which has been extracted with alcohol is digested in a retort with from 8 to 9 times its weight of nitric acid of 1·30–1·35 spec. grav., and the action of the acid, which is very violent at the commencement, is subsequently assisted by a gentle heat, the cork is gradually destroyed and dissolved, leaving behind a peculiar, white flocculent substance, which is not further acted on by nitric acid; and on the surface of the hot liquid a fluid waxy mass separates, the quantity of which increases in proportion as the cork disappears. If, when the action has terminated, the liquid be poured while hot from the retort into a porcelain dish, the waxy matter solidifies on cooling, and may easily be removed from the subjacent liquid. This latter is then diluted with water, and the white insoluble flocculent body separated by filtration. This behaviour calls to mind Payen's lignine and cellulose.

On evaporating the filtered liquid, suberic acid separates from it in a granular crystalline state, but contaminated with oxalic acid, from which it is freed by repeated solution in hot water and cooling; it is then colourless. The suberic acid, which is scarcely soluble in cold water, separates almost entirely on the cooling of the hot liquid, while the oxalic acid remains in solution. When the mother-ley, from which the first portion of suberic acid has crystallized, is of a thick syrupy consistence, it is a sign that it should again be heated



with nitric acid, in order to obtain a further crop of suberic acid. After a time a fresh quantity of acid separates, and a small quantity of a yellow mother-ley of a bitter taste remains.

*Cerine, Cork-wax*.—Cork-wax, when crystallized several times from alcohol, is of a pale yellow colour, and forms acicular crystals, which become soft in boiling water, cake together, and sink to the bottom. Heated in a glass tube, it is decomposed, without first melting, into products having an empyreumatic odour; the smell of acroleine was not perceptible. Heated on platinum foil, it takes fire and burns with a clear lucent flame, diffusing an odour not at all disagreeable. On boiling it with caustic potash of 1·27 spec. grav. its colour is changed, but it is not dissolved; on addition of acid to the brown ley, a very small precipitate of a brown colour separates. On boiling it with nitric acid, it is decomposed and converted into a peculiar waxy acid, which floats on the nitric acid. Very concentrated nitric acid causes the same change, but the product is then partially dissolved in the acid, from which it is precipitated on the addition of water. Hydrochloric acid effects no perceptible change of the cork-wax even at a boiling temperature; the same is the case with dilute sulphuric acid. Concentrated sulphuric acid dissolves it to form a black solution, from which water throws down a blackish-brown product of decomposition. Dried at 212° Fahr., cerine contains in 100 parts—

			Atoms.
Carbon	75·63	75·52	25
Hydrogen	10·55	10·49	10
Oxygen	13·82	13·99	3

*Suberine*.—This name has been applied to the substance which remains when finely-filed cork has been successively treated with alcohol, æther, water and dilute hydrochloric acid, till nothing further is taken up by these solvents. There is then left a reddish-gray body, which has still the form and physical properties of cork; heated on platinum foil, it burns with a bright flame, and diffuses the peculiar smell which cork evolves on combustion. Heated in a glass tube, it gives off the same empyreumatic products as when cork is burnt; on incineration it leaves behind 0·5 per cent. ash.

This substance cannot be obtained in a pure state; it still incloses cork-wax, of which it cannot be deprived by mere digestion in æther and in alcohol; for when suberine is submitted to the action of nitric acid, and the liquid is saturated with ammonia, filtered, and an acid added in excess to the ammoniacal solution, turbidness ensues, and after a time a deposition of ceric acid. The suberine moreover contains a small quantity of a nitrogenous body, and the substance (cork-cellulose) insoluble in nitric acid. It was found to consist of 67·8 C., 8·7 H., 2·3 N., 21·12 O.

*Ceric Acid*\*.—This is the waxy, liquid mass of brownish-yellow colour, which separates on the surface of the acid on the oxidation of the cork. It is a product of the action of the nitric acid on cerine,

\* Not to be confounded with Hess's ceraic acid.



from which it may also be directly prepared. In its chemical properties it is related to the fat acids. When pure cerine is digested with hot nitric acid, it gradually becomes liquid; carbonic acid and red vapour of nitrous acid are evolved, and small quantities of oxalic acid may be demonstrated in the liquid filtered from the ceric acid.

The impure ceric acid thus obtained is purified from adhering nitric acid by repeated washing in hot water, in which, as well as in cold water, it is insoluble. By solution in alcohol, filtration and evaporation, it is obtained free from any mechanical impurities. It then forms a yellowish-brown, somewhat transparent, waxy mass, which becomes soft at a very gentle heat, and melts below the boiling point of water. Heated on platinum foil, it takes fire and burns with a bright lucent flame; exposed to heat in a glass tube, it is decomposed, with disengagement of empyreumatic products. It is easily soluble in ammonia and in solution of potash, from which it is separated on the addition of an acid. It undergoes no further change on being boiled with nitric, hydrochloric or dilute sulphuric acid. Concentrated sulphuric acid blackens and destroys it. It forms insoluble compounds with the oxides of the heavy metals; it is indifferent towards acids. Dried at  $212^{\circ}$  Fahr., it contains in 100 parts—

			Atoms.	Calculated.
Carbon . . . .	64.92	64.65	42 = 3150	65.06
Hydrogen . .	8.72	8.77	17 = 425	8.58
Oxygen . . . .	26.36	26.58	13 = 1300	26.36
	<u>100.00</u>	<u>100.00</u>	<u>4875</u>	<u>100.00</u>

Two combinations with lead were prepared; the one was obtained by adding a solution of sugar of lead to the alcoholic solution of the ceric acid as long as a precipitate was formed; the second by mixing a solution of ceric acid in ammonia with solution of sugar of lead. Both precipitates subside quickly, and may be easily edulcorated. The amount of base was determined in these combinations by treating them with sulphuric acid, and removing the free sulphuric acid and ceric acid with hot alcohol. The first salt, dried at  $212^{\circ}$  Fahr., consisted in 100 parts of—

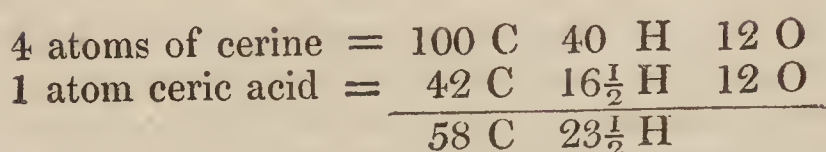
			Atoms.	Calculated.
Carbon . . . . .	51.50	51.47	42	51.63
Hydrogen . . . . .	6.91	6.90	$16\frac{1}{2}$	6.61
Oxygen . . . . .	19.19	19.23	12	19.33
Oxide of lead. . . . .	22.40	22.40	11	22.43

The second salt contained—

Carbon . . . . .	35.50	35.39	42	35.65
Hydrogen . . . . .	4.86	4.80	$16\frac{1}{2}$	4.57
Oxygen . . . . .	13.36	13.53	12	13.32
Oxide of lead. . . . .	46.28	46.28	3	46.64

By comparing the relative number of atoms for cerine with the formula of the anhydrous ceric acid, and taking 4 atoms of the former, the formation of the acid from the cerine is easily explained. Carbon and hydrogen remain after deduction of the ceric acid.





But, as above stated, the formation of carbonic acid and of oxalic acid may be demonstrated on the oxidation of cerine by nitric acid, and as the formation of water in this process cannot be doubted, cerine may be conceived to be decomposed by treatment with nitric acid into ceric acid, carbonic acid, oxalic acid and water. The formation of other products could not be detected.

*Cork-cellulose.*—The author applies this name to the insoluble white flocculent body which remains suspended in the liquid on digesting cork with nitric acid, from its behaviour towards sulphuric acid, its mode of formation, and its resemblance in this respect to the cellulose obtained by Payen from ligneous fibre. It is obtained pure by washing it with water after the ceric acid has been removed, until every trace of adherent acid has disappeared, and by digesting it then with strong alcohol as long as this takes up anything.

Cork-cellulose is insoluble in hot and in cold water, alcohol and æther; it is not further changed by nitric and muriatic acids, nor by caustic potash and ammonia; it dissolves easily in concentrated sulphuric acid, without any alteration of colour; heated on platinum foil, it takes fire without previously melting, and burns with a bright lucent flame; heated in a glass tube, it gives off empyreumatic products, which do not differ in smell from those usually afforded by the dry distillation of non-nitrogenous bodies.

The formation of this body in the oxidation of cork was noticed by Chevreul, who regarded it as ligneous fibre, but it has either been overlooked or not mentioned by other chemists. Two analyses of the substance dried at  $212^{\circ}$  gave the following results:—

			Atoms. Calculated.	
Carbon	44.80	45.01	12	44.91
Hydrogen	6.05	6.06	5	6.11
Oxygen	49.15	48.93	10	48.98

Liebig's *Ann. der Chem. und Pharm.*, March 1843.

### *Recent Researches on the Chemical Composition of Bones.*

[Concluded from page 376.]

M. Nasse has also examined a considerable number of bones of diseased persons, for which purpose a rib from each individual was selected. The pieces of rib were first freed from cartilage and periosteum, weighed fresh, then dried at  $212^{\circ}$  Fahr., and again weighed. The amount of fat was then determined by extraction with æther, the organic matters were destroyed by calcination, the soluble salts extracted from the ash, the residue dissolved in hydrochloric acid, and from the solution the phosphate of lime precipitated by ammonia, the carbonate of lime by oxalate of ammonia, and lastly the magnesia by phosphate of soda and ammonia. The following are the results from 15 analyses:—



	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
Fat .....	2.17	14.35	2.78	34.70	2.39	9.83	14.46	2.78
Gelatine (albumen & fibrine) .....	52.10	37.17	39.33	31.36	44.02	42.02	37.56	41.77
Phosphate of lime .....	35.96	39.53	48.70	27.84	37.39	43.69	40.74	47.93
Carbonate of lime .....	8.15	6.34	6.67	5.22	13.08	2.79	6.11	6.52
Salts soluble in water .....	0.60	0.43	0.59	0.60	0.61	0.56	0.49	0.54
Carbonate of magnesia.....	1.02	0.23	0.28	0.28	2.51	0.21	0.35	0.36
Loss .....		1.95	1.65	0		1.35	0.29	

	IX.	X.	XI.	XII.	XIII.	XIV.	XV.
Fat .....	3.75	2.27	6.82	50.57	14.37	11.63	45.19
Gelatine (albumen & fibrine) .....	41.02	44.96	40.56		37.48	44.93	
Phosphate of lime .....	44.21	43.85	45.44	36.41	41.10	37.33	45.85
Carbonate of lime .....	10.37	7.11	5.58	12.44	5.96	4.71	7.07
Salts soluble in water .....	0.47	0.58	0.52	0.48	0.50	0.46	0.44
Carbonate of magnesia .....	0.18	1.23	1.03	0.10	0.04	0.08	0.22
Loss .....	0			0	0.55	0.86	1.23

These relations are calculated in 100 parts for the dried and not for the fresh bones, as the amount of water is so liable to change from the presence of the atmosphere. On an average it amounted to 42.8 per cent., for instance in I. 42.1, II. 36.6, III. 51.85, IV. 40.7, V. 54.3, VI. 45.1, VII. 40.3, VIII. 45.6, IX. 43.2, XI. 44.1, XII. 43.1, XIII. 37.2, XIV. 39.9, XV. 35.8.

It appears also that the hardness of the bones which M. Nasse determined in each instance in the fresh state bears no relation to the amount of water, nor does it appear that the osseous tissue contains more water in dropsy than in other conditions. The ribs were derived from the following individuals:—

I. A youth, 18 years of age, with suppurated pulmonary tubercles and hydrocephalus. The ribs flat and of firm texture.

II. A woman, 50 years of age, who had formerly suffered very much of rhachitis, with ulceration of the colon, and a moderate diarrhoea. The ribs hard, thick and bent.

III. A man, 49 years old, with medullary sarcoma, very thin. The ribs light and very brittle.

IV. A man, 70 years of age, strongly addicted to spirits, badly nourished. Ribs light, very fragile.

V. A man, 47 years of age, had been ill two years, very thin, with ulcers of the intestines and diarrhoea, without tubercles in the lungs.

VI. A small thin boy, 17 years of age, formerly scrophulous, epileptic, and at last lethargic, with obstruction of the urinary bladder. The brain was found somewhat indurated, in the lungs inflammation and a few tubercles. Ribs thin, light, elastic.

VII. A man, about 50, with disease of the heart, and dropsy, but not considerable, which had arisen from it; died suddenly, and was therefore not much fallen away. Ribs very firm.

VIII. A boy, 16 years of age, very thin, with pulmonary tubercles. The ribs remarkably full of juice, so that the periosteum might easily be removed.

IX. A young man, of 19, with pulmonary tubercles just begin-



ning to become soft, pretty well fed, secretions not very considerable, and afflicted for some weeks with hectic fever. The bones very solid, periosteum difficult to remove.

X. A strongly-built man, 36 years of age, accustomed to rather considerable quantities of spirits, died in a state of great thinness from a rapidly-developed consumption. Ribs flat and somewhat thin.

XI. A man, 30 years of age, died of a chronic disease of the brain, inflammation and disease of the lungs, without any previous falling off in size. Bones very hard and thick.

XII. A woman, 24 years of age, confined three weeks before her death, which resulted from suppuration of the thigh-vein, and secretions of pus into the pericardium. Ribs well-formed, not coarse.

XIII. A young man, 21 years of age, with general chronic dropsy, which had originated after an inflammation of the diaphragm, but had been maintained by an enlargement and induration of the spleen. Ribs thin, light, full of blood, and fatty.

XIV. A very fat man, 48 years of age, very much addicted to spirits, died suddenly of apoplexy. Ribs roundish, not hard, full of blood, and fatty.

XV. A lean man, 35 years of age, with water on the brain and a small abscess in the brain. Ribs flat, hard, white, and containing no blood.

The organic constituents are to the inorganic on an average as 50·12 to 49·88. In drunkards (IV. and XIV.) the former are predominant; in medullary sarcoma (III.) they decrease very considerably, which is likewise the case in consumptive diseases. The fat extracted with æther contains phosphorus, is for the greater part fluid, and in drunkards it is quite oily. On calcining the bones previous to the extraction of the fat, some phosphate of lime is formed at the expense of the carbonate. In consumption and medullary sarcoma the amount of fat is far beneath the mean average, which amounts to 9·37 per cent.; in those addicted to drinking it is considerably above it. When the amount of fat is increased, there is in general a decrease in that of the gelatine. The phosphate of lime is to the carbonate, on an average, as 41·09 to 7·22; increase of the one does not at all necessitate a decrease of the other, or *vice versâ*. When the earthy constituents are found to decrease, the carbonate of lime seems to disappear sooner and more rapidly than the phosphate. The mean amount of soluble salts in bones is, with slight variations, 0·52 per cent.; these were found, in an experiment made on purpose with six ribs, to consist of 0·253 lactate (and carbonate) of soda, 0·134 chloride of sodium, 0·101 phosphate of soda, 0·032 sulphate of soda. The chloride of sodium amounts to less than in the serum of the blood. The lactate of soda is probably in combination with the gelatine. The phosphates and sulphates probably result from the phosphorus and sulphur contained in the organic substance.

In the case No. IV. M. Nasse made a comparative examination of a rib-bone and rib-cartilage, and found—



	Bone.	Cartilage.
Fat . . . . .	34.70	3.16
Gelatine . . . . .	31.36	87.70
Phosphate of lime . . . . .	27.84	2.17
Carbonate of lime . . . . .	5.22	3.07
Soluble salts . . . . .	0.60	3.08
Magnesia and loss . . . . .	0.28	1.90

The ribs contained 40.7 per cent. water, the cartilage 54.8. In the cartilage the carbonate of lime forms three-fifths of the entire amount of lime. The larger amount of soluble salts in the cartilage is remarkable.

*Action of Sulphur upon Oxide of Copper at a high Temperature.*  
By M. JORDAN.

On heating a mixture of sulphur and oxide of copper, very different products of decomposition are obtained, according to whether more or less of the one or other substance has been employed. The method therefore for preparing sulphurous acid from sulphur and oxide of copper, described by M. Marchand, can only succeed under certain conditions. A mixture of sulphur and 0.545 gm. oxide of copper was heated in a small glass retort; 0.22 sulphurous acid was formed, and the black residue in the retort, from which the excess of sulphur had been removed by distillation, indicated not a trace of any soluble salt of copper, and proved on further examination to consist of pure sulphuret of copper. If we calculate the quantity of sulphurous acid which could possibly be formed from 0.545 gm. oxide of copper, it is found to agree with the quantity above mentioned; whence it is evident that in this experiment the whole of the oxygen of the oxide of copper is required for the production of sulphurous acid with formation of sulphuret of copper. 2 atoms of oxide of copper and 3 atoms of sulphur, or 100 parts oxide of copper and 60.87 sulphur, are entirely decomposed into sulphuret of copper and sulphurous acid.

If little sulphur and a great excess of oxide of copper be employed, not a trace of sulphurous acid is disengaged on exposing this mixture to the action of heat; the reddish-brown mass which remains behind affords on extraction the whole amount of sulphuric acid in the state of sulphate of copper which could be formed from the quantity of sulphur employed; only protoxide of copper and peroxide could be found in the residue, but not a trace of sulphuret of copper. 1 atom of sulphur therefore and 7 atoms of oxide of copper, or 100 parts sulphur and 1724.8 oxide of copper, are decomposed entirely into sulphate of copper and protoxide. Only when the mixture had been exposed to considerable red heat, at which the sulphate of copper formed becomes decomposed, was any sulphurous acid disengaged; and for this an extremely high temperature is requisite; we know, for instance, that sulphurous acid is not frequently formed in the organic analysis of bodies containing sulphur. If the compound contained ready-formed sulphuric acid, or any other oxide of sul-



phur, this might probably be reduced at the high temperature, by the presence of organic substances, to sulphurous acid, and be carried away as such along with the carbonic acid. Moreover, on employing the quantities found by calculation to be absolutely requisite, in the first case only a slight trace of sulphate of copper was formed, and in the latter just as small a quantity of sulphuret of copper, evidently resulting from the mixture in both cases not being sufficiently well mixed, so as not to give rise to this slight formation of accidental products. Perfectly pure protoxide of copper cannot therefore be prepared by heating of sulphur with oxide of copper, which otherwise would be a very cheap method.—*Journ. für Prakt. Chem.*, xxviii. p. 222–224.

### *Hyposulphates of the Protoxide and of the Peroxide of Mercury.*

According to M. Rammelsberg, freshly-precipitated protoxide of mercury dissolves in hyposulphuric acid, and affords on evaporation of the solution a white crystalline salt, which contains 74.78 per cent.  $\text{Hg}^2\text{O}$  is therefore neutral and anhydrous; it dissolves with difficulty in water, easily in dilute nitric acid, is blackened by boiling with water, is decomposed by alkalies, and affords on exposure to a high temperature metallic mercury, sulphuric acid, and sulphate of mercury.

When peroxide of mercury is digested with hyposulphuric acid, a protosalt crystallizes on evaporation from the free acid which remains behind: a neutral per-salt does not exist. When however an excess of peroxide of mercury is employed, a basic salt is obtained of a yellowish-white colour, which is decomposed by potash, is soluble in dilute muriatic acid, and is decomposed on exposure to heat into a powder consisting of metallic mercury and the protosulphate of mercury. It contains 80.84 per cent.  $\text{HgO}$ , and 20.05  $\text{S}^2\text{O}^3$ , and is therefore  $5\text{HgO} + 2\text{S}^2\text{O}^3$ .—Poggendorff's *Annalen*, lviii. p. 472.

### *On the Properties of Wax.* By M. GERHARDT.

Under the oxidizing influence of nitric acid, wax furnishes exactly the same acids as were obtained by M. Laurent from the fat oils. I boiled some for several days with twice its weight of nitric acid, until the whole of the oily substance had disappeared; the first crystalline granules that were deposited on the cooling of the mixture had all the properties and the composition of *pimelic acid*. The mother-ley afforded a considerable quantity of hemispheric tubercles of *adipic acid*, and in the liquid in which these had formed I found some needles of *lipic acid*. The last waters would not crystallize, and contained the oily acid known by the name of *azoleic* or *cenanthylic acid*, remarkable from its smell of rank butter, and of which moreover a considerable quantity had volatilized during the ebullition of the mixture.

Boiled for half an hour with nitric acid, wax is entirely converted into a solid fat acid, which is wholly saponified by carbonate of



soda. I have not yet analysed it, but its physical characters lead me to suppose it to be identical with margaric acid. When wax is treated with the same agents until no more red vapours are given off, it is converted, as was observed by Mr. Ronalds, into *succinic acid*.

These numerous products are not formed at once; they result from a successive combustion of the carbon and hydrogen contained in the wax. This body has moreover a far more simple constitution than that assigned to it by M. Lewy.

Wax (or rather cerine) is the *aldehyde* of the stearic series, viz.



These formulæ are in perfect accordance with the analyses of M. Lewy, and also with those of Chevreul and Erdmann, made on stearic acid in a current of oxygen:—

	Wax.			Stearic acid.		
	Calculated.	Found.		Calculated.	Found.	
Carbon. . . .	80·8	80·53	80·23	76·5	76·4 C.	76·3 E.
Hydrogen..	13·4	13·61	13·30	12·8	12·4	12·8
Oxygen ..	5·8	5·86	6·47	10·7	10·7	10·9

From these formulæ it will be seen that the products of oxidation of the wax may be arranged in the following manner, stearic acid being considered the first, and succinic acid the last term of the series.

Monobasic acids.		Bibasic acids.	
Stearic acid. . . .	$\text{C}^{76} \text{H}^{38} \text{O}^2$	.....	
Margaric acid..	$\text{C}^{68} \text{H}^{34} \text{O}^2$	.....	
.....		Ænanthylic acid	$\text{C}^{56} \text{H}^{28} \text{O}^4$
.....		Pimelic acid....	$\text{C}^{28} \text{H}^{12} \text{O}^4$
.....		Adipic acid ....	$\text{C}^{24} \text{H}^{10} \text{O}^4$
.....		Lipic acid.....	$\text{C}^{20} \text{H}^6 \text{O}^4$
.....		Succinic acid ..	$\text{C}^{16} \text{H}^6 \text{O}^4$

There are evidently some terms wanting, and I am somewhat surprised at not having obtained suberic acid from the wax, but probably the circumstances under which I operated were unfavourable, suberic acid itself being attacked by nitric acid.

I have some reasons for regarding succinic, suberic, pimelic acids, &c. as bibasic. Under the influence of fusing potash they behave quite differently to the monobasic acids, which I have had occasion to examine in this respect. The bibasic acids in question divide into two, and are converted, with disengagement of hydrogen, into oxalic acid and liquid and volatile acids, among which I have already detected formic, acetic, valerianic, or phocenic acids. I shall subsequently communicate further details on this subject, and will merely mention at present, that pimelic acid appears to divide exactly into oxalic acid and valerianic acid.



Although these reactions are effected in a very quiet manner and without the mass becoming black, they are of difficult investigation,



from the great resemblance of the products in their physical characters.

They are of great interest, as they show that by the simple combustion of the wax contained in the fodder of cattle or in marine plants, it may be converted into volatile fat bodies similar to those of the butter or of fish-oil.

Cetaceum is the *aldehyde* of the ethalic series, just as wax is that of the *stearic* series.—*Comptes Rendus*, April 24, 1843.

*On the Cause of the Reduction of Metals from Solutions of their Salts by the Voltaic Circuit.* By ALFRED SMEE, Esq., F.R.S.

The reduction of a metal from its saline solution by the agency of voltaic electricity, has, the author states, been explained in three different ways. By Hisinger, by Berzelius, and by Faraday it has been ascribed to the liberation of hydrogen in this process: Davy and others considered it as resulting directly from the attraction of the metal to the negative pole: and Daniell conceives that the metal [solution?] is directly electrolysed by the action of the voltaic circuit. The author found that the ends of copper wires, placed in a solution of sulphate of copper between two platina poles in the circuit, manifest electric polarity; so that while one end is dissolving, the other is receiving deposits of copper: he also found that platina was, in like manner, susceptible of polarity, although in a much less degree than copper, when placed in similar circumstances. With a view to determine the influence of nascent hydrogen in the voltaic reduction of metals, he impregnated pieces of coke and of porous charcoal with hydrogen, by placing them, while in contact with a metal, in an acid solution, when they thus constituted the negative pole of the circuit; and he found that the pieces thus charged readily reduced the metals of solutions into which they were immersed; and thence infers that the hydrogen is the agent in these reductions. From another set of experiments he concludes, that during these decompositions, water is really formed at the negative pole; a circumstance which he conceives is the chief source of the difficulties experienced in electro-metallurgic operations when they are conducted on a large scale, but which may be avoided by a particular mode of arranging the elements of the circuit so as to ensure the uniform diffusion of the salt.

The author obtained the immediate reduction of gold, platina, palladium, copper, silver and tin from their solutions by the agency of hydrogen contained in a tube, with a piece of platinized platina in contact with the metallic salt: nitric acid and persalts of iron, on the other hand, yielded their oxygen by the influence of the same agent.

The general conclusion which he deduces from his experiments is that, when a metallic solution is subjected to voltaic action, water is decomposed, its oxygen passing in one direction, and its hydrogen in the opposite direction; the latter element performing at the moment of its evolution at the negative pole the same part with respect to a solution of sulphate of copper, that a plate of iron or zinc would perform to the same solution.—*Philosophical Magazine* for July 1843.



*On the Action of Iodine on Oxides in Contact with Water, especially on Oxide of Lead. By M. JAMMES.*

Iodine, as is well known, has so great an analogy with chlorine and bromine in its behaviour towards the different reagents, that each time a new series of chlorine combinations has been discovered we have been naturally led to seek whether bromine or iodine would not furnish, under similar circumstances, analogous compounds.

Some experiments which I made long ago had led me to think that the action of iodine on the oxides had more analogy with that which is exerted by chlorine (by the intervention of water) than was supposed.

On endeavouring to form and to isolate iodic acid, the existence of which has been presumed, without however its having yet been placed beyond doubt, I was induced to cause iodine to act on various oxides; and in the course of my researches, which were not long in taking another direction, I discovered several new and interesting facts. It was my intention not to have published anything on the subject until I had completed my investigations, but the discovery of a blue compound of iodine and of oxide of lead, recently announced by M. Durand, has altered my determination, at least with regard to the action of iodine on the oxide of lead in the presence of water. Long before the publication of M. Durand's memoir, I had frequently caused iodine to act on the oxide of lead suspended in water, sometimes cold and sometimes hot; I obtained the blue compound described in his memoir only once; and for a long time I sought to reproduce it without success. It is however possible, by help of a little artifice, to transform the compound which I obtained into that which has been formed by M. Durand.

If we place some iodine, in a cold state, in contact with water and some litharge, there is scarcely any action, as has been indicated by M. Gay-Lussac. It is the same also with massicot. These oxides are too cohesive to act upon iodine. If hot, the action is also scarcely perceptible; the iodine volatilizes without combining with the oxide.

If we take some pure hydrate of the oxide of lead, which has been thoroughly separated from the subsalts which accompany it on its precipitation, we obtain, after a few moments, in a cold state, a pale violet or slightly reddish-coloured compound, which contains iodine and oxide of lead; but no blue compound is ever obtained.

This wine-coloured powder decomposes but slowly at the temperature of boiling water, so that after having obtained this compound of iodine and of oxide in the cold, the excess of iodine may be driven off by boiling. When the aqueous vapours are disengaged pure, the compound is collected on a filter, washed at different times, and dried sheltered from the air.

This powder changes slowly in the atmosphere, without losing any appreciable quantity of iodine, but it absorbs the carbonic acid very rapidly.

Strongly heated, it disengages oxygen, and leaves a residue of



iodide of lead. Alcohol does not remove any iodine from it, showing that it is really in combination. Boiling water deprives it of some traces of iodide of lead, but the quantity is scarcely appreciable. Acids decompose it with disengagement of oxygen. The analysis of this powder has led me to regard it as a compound in definite proportions of iodine and oxide of lead. I obtained as a mean of three analyses 83.82 per cent. oxide of lead. These analyses were made by placing the powder in a carefully-cleaned platinum dish, adding some sulphuric acid, and heating it cautiously; the iodine is expelled, and the lead remains in the state of sulphate.

Three analyses for the determination of the iodine gave 16.23 per cent. as a mean.

To determine the iodine, I dissolved the compound in pure caustic potash; the solution having been saturated with sulphuric acid, all the lead was precipitated in the state of sulphate, and the iodine remained in solution in the liquor in the state of iodate and iodide; the liquor was evaporated to dryness after having been properly neutralized, and the residue calcined in a small porcelain crucible in order to convert the iodate of potash into iodide; this latter being dissolved in distilled water, was precipitated with a solution of nitrate of silver.

The powder is entirely soluble in caustic potash; it appears to contain 6 equivalents of oxide of lead for 1 of iodine. The exact constitution of this compound does not seem easy of explanation, unless we consider it really as a compound of iodine and of oxide of lead.

The numbers which these analyses furnish lead to the formula  $I + 6PbO$ , according to which we should have—

	Calculated.	Found.
Oxide of lead . . . . .	84.12	83.82
Iodine . . . . .	15.88	16.23

But the difference between the calculated and found result is too great to be considered accidental; and as this difference has always been constant in my analyses, I am induced to explain it in the following manner. When iodine acts on the oxide of lead in contact with water, there is formed, independent of the preceding compound, a small quantity of iodide, and probably a little iodate of lead, which are not wholly removed by edulcoration. The mixture of these two compounds would necessarily give, in the analysis, a loss in oxide of lead, and an excess of iodine. However this may be, the constancy of the results obtained induces me to consider the compound as formed of 1 equivalent of iodine combined with 6 of oxide of lead, mixed with a little iodide and iodate of lead.

I have prepared it at different intervals, and have always found its composition identical.

It is easily obtained by placing some pure and moist hydrate of oxide of lead in contact with recently prepared tincture of iodine. Iodine in powder succeeds as well, but the action is rather slower; the iodine which does not enter into combination may be removed by washing with alcohol.



In order to obtain M. Durand's blue compound, it suffices to add to the preceding mixture a few drops of a solution of nitrate or acetate of lead; the existence of a subsalt of lead is indispensable for its production. This blue compound must have therefore a more complicated composition than M. Durand supposes; for it seems to me certain that the subsalt of lead enters into its composition. I hope in a short time to be able to make known the results of its analysis. —*Journ. de Pharm.* for April 1843.

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## ANALYTICAL CHEMISTRY.

*On an easy and certain Method of distinguishing Antimonuretted Hydrogen from Arsenuretted Hydrogen.* By Dr. MEISSNER.

I HAVE recently succeeded in discovering a method of distinguishing, by means of Marsh's apparatus, between arsenuretted and antimonuretted hydrogen in a very simple and evident manner. It is based on the property possessed by the caustic alkalies, when dissolved in alcohol, of decomposing the antimonuretted hydrogen, and separating the metal in the form of brownish-black flakes, while the arsenuretted hydrogen undergoes no perceptible change. For the execution of the experiment I employed a Woulfe's bottle with two necks, in which the gases were liberated from zinc, arsenious acid and tartar-emetic, by means of dilute sulphuric or muriatic acid. A long funnel, reaching to the bottom of the flask, was inserted into the one neck for pouring in the acid, and through the other a tube bent at right angles, in which a layer of cotton was placed to absorb any traces of water or acid that might be carried over; this tube was then connected with a Liebig's apparatus, which was successively filled with alcoholic solution of caustic potash, caustic soda, caustic lithia and caustic ammonia; and the two gases first conveyed through it separates them conjointly. The pure arsenuretted hydrogen produced no perceptible alteration in the solutions, with the exception of a few white flakes, which became evident towards the close of the operation. The pure antimonuretted hydrogen was, on the contrary, immediately decomposed, and the metal deposited in the form of brownish-black flakes. This appearance is also evident when a mixture of the two gases is made to pass through the alcoholic alkaline solutions. To determine the degree of sensitiveness of the process, a mixture of arsenious acid and of 1.00, 0.100, 0.010 and 0.001 per cent. tartar-emetic was conveyed into the flask for generating the gases, and the gas liberated by means of zinc and sulphuric acid passed through the Liebig apparatus containing ammoniated alcohol. In each case a rapid decomposition of the antimonuretted hydrogen ensued, and even the last small admixture of 0.001 per cent. tartar-emetic was immediately recognized by the yellow colouring of the ammoniacal solution and the blackish-brown flocks which subsequently separated, and which proved on further



examination to be antimony. To decide the question whether the entire quantity of the antimonuretted hydrogen was decomposed in this process, I connected the Liebig apparatus with a glass tube, through which the gas escaping from the solution of ammonia had to pass, and formed in it with a spirit-lamp the well-known metallic rings. On treating these with solution of chloride of sodium, according to Bischoff's directions, they easily dissolved, with the exception of a few scarcely perceptible blackish flakes. It may therefore be admitted with certainty that when a sufficient quantity of ammoniacal solution has been employed and the evolution of the gas has been conducted carefully, that the antimonuretted hydrogen is entirely decomposed and separated from the arsenuretted hydrogen.

I next investigated the action of these gases on other spirituous liquids, and passed them through pyroligneous æther and aldehyde. The pyroligneous æther had, neither alone nor in combination with caustic potash or caustic ammonia, any perceptible decomposing action on the arsenuretted hydrogen; but on passing antimonuretted hydrogen through these solutions their colour changed, and after a time the metal separated in black flakes. A mixture of the two gases had scarcely any perceptible action on the solution of caustic ammonia and pyroligneous æther; in the solution of caustic potash a gray opacity resulted and a similarly-coloured precipitate.

When aldehyde was shaken with caustic potash and arsenuretted hydrogen passed through the clear solution, no change occurred; but with antimonuretted hydrogen a brownish-black turbidness took place and a precipitate of the same colour. Solution of caustic ammonia in aldehyde exhibited no apparent action on arsenuretted hydrogen, while on the passage of antimonuretted hydrogen it very soon became yellow, then brown, and deposited brownish-black flakes.

It is evident therefore that solutions of the alkalies in pyroligneous spirit and in aldehyde have the property of decomposing the antimonuretted hydrogen and separating the metal. The alcoholic alkaline solutions however seem to deserve the preference from their greater sensitiveness; and they will afford a certain and easy method of detecting and separating from each other very quickly and readily the two gases in medico-legal examinations.—*Archiv der Pharm.* for April 1843.

#### *Testing Solution of Chlorine for Muriatic Acid.*

According to M. Herzog, on shaking metallic mercury with solution of chlorine, the chlorine is so entirely removed (calomel alone being formed, and not a trace of sublimate), that the presence of muriatic acid may be ascertained from the acid reaction of the liquid. M. Wackenroder confirms this; but for the case in which chlorine and chlorous acid occur in the same solution, the use of calomel is preferable to that of metallic mercury. On shaking calomel with chlo-



rous acid, even after the addition of chloride of sodium, the bleaching property is not destroyed, while metallic mercury likewise deprives the chlorous acid of nearly all its chlorine, being precipitated as an oxichloride.—*Archiv der Pharm.*, Feb. 1843.

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## PHARMACOLOGY.

### *On some Indian Articles of Materia Medica.*

#### CALOTROPIS GIGANTEA. Nat. ord. *Asclepiadææ*.

A LARGE shrub common in many parts of India, and extensively cultivated in the Calcutta Botanic Garden. The root, bark, and inspissated juice are used extensively for their emetic, diaphoretic, alterative and purgative properties, which have been known for many centuries to the Indian practitioners, and have of late attracted much notice from European physicians.

The milk when dried in the water-bath loses 75 per cent. The residue yields to alcohol 17, and then to water 4 parts. The watery extract, prepared previously to the action of alcohol, is 11 grs. The alcoholic tincture is precipitated by water, yielding a white resin. The alcoholic extract, in doses of 10 grs., acts as a powerful but uncertain cathartic, and frequently causes violent vomiting; we have used it in an extensive series of trials, and do not regard it as a remedy on which reliance can be placed.

The dried bark of the root is of a grayish-yellow colour, heavy and very peculiar smell, acrid, nauseous. It yields to water at 70°, 15 per cent. of gummy saccharine matter, and a peculiar extractive principle, which has the singular property of gelatinizing as it is heated, then liquefying again, and as the solution cools gelatinizing as before. This principle is termed *Mudarine* by its discoverer, Dr. Duncan.

The powdered bark of the root, in doses of from  $\frac{1}{2}$  a drachm to 1 drachm, proves emetic after an interval of from twenty minutes to an hour, generally causing much nausea, and in about one case in every three inducing a cathartic operation. In doses of from 2 to 5 grs., taken every half-hour, it proves nauseant, powerfully diaphoretic, and after several doses gently cathartic. On the whole, this preparation may be deemed one of our best substitutes for ipecacuanha, producing similar emetic and diaphoretic results; combined with opium it affords a good representative of the Dover's powder of the British Pharmacopœia. In dysentery it may be very safely substituted for ipecacuanha in Mr. Twining's and other formulæ, about twice the quantity being used in each dose.

In Indian medicine the powdered root, bark, and the dried milk, are used in small doses in a multitude of disorders, and enjoy high reputation as alteratives in the treatment of lepra, elephantiasis, secondary syphilis, and in several spasmodic diseases. The clinical experiments of Mr. Playfair, Dr. Duncan and Dr. Royle, leave no doubt of the bark of the root being really efficacious in incipient leprosy, and in numerous diseases of the skin.



THALICTUM FOLIOSUM. Nat. ord. *Ranunculaceæ*; Tribe *Anemonea*.

The root of this plant, abundant in the Himalayas, has been used in the Hospital of the Medical College of Calcutta in several cases of ague, and as a tonic in convalescence from acute diseases. 5 grs. of the powder, or 2 grs. of the watery extract, given thrice daily, have in some cases prevented, and in several moderated, the accession of fever, and at the same time acted gently on the bowels. The only sensation experienced was warmth at the epigastrium and a general comfortable feeling.

It deserves extensive trial, and promises to succeed well as a febrifuge of some power, and a tonic aperient of peculiar value.

COPTIS TEETA. Nat. ord. *Ranunculaceæ*; Tribe *Helleborea*.

The root has been extensively used in the General Hospital by the late Mr. Twining, who reported that its influence in restoring appetite and increasing the digestive powers were very remarkable, and that it might be said to possess all the properties of our best bitter tonics.

Further trials in the College Hospital were equally satisfactory. It did not seem to exercise any febrifuge virtue, but under its influence several patients recovering from acute diseases manifestly and very rapidly improved in strength. The dose was 5 to 10 grs. of the powder, or 1 oz. of the infusion thrice daily.—From Dr. O'Shaughnessy's *Bengal Dispensatory*.

#### *Chemical Examination of Impatiens noli tangere.*

According to M. Müller, 100 parts of the dried powder of the leaves of this plant contain 2.04 chlorophylle and oil, 15.25 of a bitter resinous emetic substance, 1.42 wax, 4.77 resin, 1.06 sugar, 7.24 gum, 4.96 of an astringent substance giving a blue colour with iron, 3.68 of an astringent substance giving a green colour with iron, 10.33 albumen, 30.66 vegetable fibre, 17.49 salts, consisting of lime, potash, magnesia, silica, peroxide of iron, sulphuric acid, carbonic acid, phosphoric acid, and chlorine. The emetic substance, which is partially extracted by æther, but more readily by alcohol, and to which the author assigns the name of Impatiinide, is certainly of a more complex nature.—*Archiv der Pharm.* for March 1843.

#### *Amount of Benzoic Acid in the Benzoin from Siam.*

This benzoin, which has been recently introduced into commerce, and consists of agglutinated broad laminar pieces, does not differ essentially from the other benzoin. From some experiments which M. Wackenroder has made with it, 5 per cent. of benzoic acid might be extracted from it by treatment with carbonate of soda; and the residue afforded, on being boiled with hydrate of lime and much water, 4 per cent. more pure benzoic acid. There is therefore no difference between this benzoin and the other kinds, previously known, in the amount of benzoic acid.—*Archiv der Pharm.*, March 1843.



## CHEMICAL PREPARATIONS.

*On the Preparation and Properties of Caseine.* By M. ROCHLEDER.

IN order to prepare pure caseine, some dilute sulphuric acid is added to fresh milk and then warmed, when the separated caseine collects in a cohering mass, which is separated from the greater portion of the inclosed whey by kneading in frequently-renewed pure water, after which it is treated in the cold with a concentrated solution of carbonate of soda, until the whole of the caseine has dissolved to a turbid syrupy liquid. This solution, which contains an excess of carbonate of soda, is allowed to stand at a temperature of 70° Fahr. in shallow vessels until the butter has separated in a layer at the top. The greater portion of the butter may be skimmed off, and the liquid beneath the remainder separated by means of a siphon. The solution of caseine in carbonate of soda, thus obtained, is thrown down by dilute sulphuric acid, and purified by kneading with frequently-renewed water from adherent acid and sulphate of soda.

This solution of the caseine in carbonate of soda, and precipitation with dilute sulphuric acid, is repeated three times, and in this manner the separation of the butter and inorganic constituents is effected. Filtration of the solution in carbonate of soda is purposely avoided, as in a concentrated state it passes very slowly through the filter; caseine changes easily in its solution in alkalies, and on the saturation of a very dilute solution with an acid the caseine is precipitated, not in a cohering mass, but in the state of finely-divided flakes.

The caseine thus obtained still contains sulphuric acid, which renders a portion of it soluble in water. On evaporating this solution, a transparent skin is formed on the surface, which is renewed after each removal. When a solution of carbonate of soda is added to this solution, the caseine held in solution by the sulphuric acid is precipitated in white voluminous flakes, which redissolve in the smallest excess of the precipitant.

When a considerable portion of the adherent acid has been removed by washing with water at the ordinary temperature, from sixty to seventy times the weight of the caseine of pure water is poured over it in a dish, and the whole is heated to boiling, after which it is left in quiet. When it has subsided the liquid is drawn off, and the operation repeated with a fresh quantity of pure water. This occasions no loss of substance, for the whole of the caseine contained in the water may be precipitated from its combination with sulphuric acid by a little carbonate of soda, and may be obtained pure by washing with water, alcohol and æther. After treating the caseine from fifteen to twenty times with water, in the manner above described, it has become deprived of every trace of acid, and at the same time of the power of dissolving in water.

To remove the last traces of fat and water, the caseine is boiled with absolute alcohol, and then with anhydrous æther, until these solvents leave no residue on evaporation.



The absence of sulphuric acid in the pure caseine prepared by means of this acid from the solution of the caseine in carbonate of soda, was proved by accurate experiments.

Caseine prepared in the above manner was dissolved in carbonate of soda, precipitated with acetic acid, and treated in the same way as above described. The caseine thus obtained, treated with alcohol and æther, had exactly the same properties as that precipitated with sulphuric acid. It afforded, when moistened with sulphuric acid, not the least smell of acetic acid, nor could any acetic acid be detected in the water, which on warming some caseine with sulphuric acid had been deposited on a cold glass held over the heated liquid.

It is evident therefore that caseine is *not* precipitated by acids from its combinations with alkalis *in combination* with the acids employed to decompose them. This indeed is proved by the composition being found to be constantly the same, as for instance in the following analyses:—

	Precipitated by Sulphuric Acid.		By Acetic Acid.
Carbon .....	54.27	53.93	54.19
Hydrogen .....	7.11	7.07	7.17

These analyses give a somewhat larger amount of carbon than the mean numbers which Dumas has deduced from his numerous analyses, but the difference is easily explained by the various methods of drying. The author dried the substance at 293° Fahr. in an oil-bath, while Dumas exposed the material to be analysed to a temperature of 284° Fahr. in vacuum.

The caseine prepared according to either of the methods above described is very slightly soluble in water. When caseine had been in contact with water at nearly its boiling point for three hours, and was then boiled for half an hour, 18.989 grms. of the cold filtered solution afforded, on evaporation in the water-bath and drying at 284°, only 0.0045 caseine, which corresponds to 0.237 parts caseine to 100 parts water. Both the caseine thrown down from its solution in alkalis by acids, as well as that precipitated from its solution in acids by carbonate of soda, reddens litmus paper, and retains this property even after desiccation at 293°, but does not communicate it to the water in which it is boiled.

This reaction agrees very well with the property of caseine, of forming neutral liquids with solutions of the carbonated alkalis, and also with the peculiarity it possesses of destroying the alkaline reaction of phosphate of soda, which dissolved in water takes up a somewhat considerable quantity of caseine to form a slimy, frothy liquid, which cannot be obtained perfectly clear by filtration, and after evaporation in the water-bath leaves behind the combination of caseine and phosphate of soda in the form of a transparent film, which separates of itself from the sides of the vessel. 20.5327 grms. of a solution of caseine in phosphate of soda, which had been diluted very much with water, and was left in contact with a considerable excess of caseine for several days at the ordinary temperature, gave, on evaporation in the water-bath and desiccation at 212°, a residue



of 0.1098 gr., which corresponds to 0.5349 parts of the combination of caseine with phosphate of soda for 100 parts water.

Notwithstanding its acid reaction, caseine, when brought into contact with bicarbonate of potash, does not expel any carbonic acid at the ordinary temperature.

Caseine dissolves with ease, and in very considerable quantity, in carbonated and caustic alkalies, from which solutions it is precipitated by all acids, with the exception of the carbonic. The precipitate is soluble in a large excess of acid. The solutions of caseine in dilute acids are milky, and cannot be obtained perfectly clear by filtration; they froth on shaking like solutions of soap, and become covered on evaporation with a transparent pellicle, which is as frequently renewed as it is removed.

When a solution of a barytes salt is added to a solution of caseine in an acid, an opakeness is produced from an insoluble combination of the caseine with barytes, even when the quantity of caseine is very small.

From the above experiments it results that pure caseine is a substance nearly insoluble in water; that the so-called soluble caseine is a combination of caseine with potash, soda or lime; and that the coagulation of the soluble caseine by acids is nothing more than a separation of the caseine resulting from the combination of the acid with the base of the caseine compound. They also point out the cause of solutions of potash preventing coagulation when added in very small quantity to milk, and explain why the slightest causes, especially in the warm months of summer, are able to produce a coagulation of the milk, as only the smallest quantity of lactic acid requires to be formed to neutralize the minute traces of soda, which are able to retain in a state of solution an enormous quantity of caseine.—Liebig's *Annalen* for March 1843.

### *Tinctura Rhei aquosa.*

As the *Tinct. Rhei aquosa* is the more liable to spoil the more dilute it is, but preserves well for a long time in a concentrated state, M. Busse recommends the preparation of a *Tinct. Rhei duplex*, and to dilute the requisite quantity of this, when wanted, with distilled water. The *Tinct. duplex* keeps very well for six to eight weeks, and does not indicate, after dilution with distilled water, any turbidness or perceptible sediment.—*Archiv der Pharm.*, March 1843.

### *Luting for Acids.*

According to M. Oenicke, the best luting for nitric acid, hydrochloric acid, &c., is prepared in the following manner:—1 part of caoutchouc is dissolved in 2 parts of hot linseed oil, and worked up with so much white clay (about 3 parts) as to form a plastic mass. This luting is excellent; it is very slightly attacked by nitric, and scarcely at all by hydrochloric acid; it softens somewhat at a high temperature, without however becoming fluid. It may be pre-



served for years without drying, except at the surface. It is however not applicable in the preparation of fluosilicic acid, the best luting for this acid being a paste formed with linseed meal and water.—*Pharm. Central-Blatt.*, May 20, 1843.

### Coloured Glasses.

*Blue.*—The double carbonate of copper and ammonia, precipitated from the solution of the nitrate, is well adapted, by fusing with glass powder in the proper proportions, for obtaining a beautiful blue glass. For 2 parts in weight of metallic copper converted into the carbonate of copper and ammonia take 32 parts glass powder.

*Yellow.*—Mix intimately equal parts by weight of white fine pulverized window-glass, calcined borax and crude antimony; melt in well-covered crucibles, and pour out on to smooth earthen tables.—*Archiv der Pharm.*, April 1843.

### *Emplastrum Adhæsivum S. Andreæ.*

M. Boldt, in Moscow, prepares under this name the following sticking-plaster:—

R<sub>x</sub> Colophon. part. 8.

Elemi, p. 11.

Ol. laur. Tereb. laric ana, p. 1. m. f. l. a. emplastr.

The plaster is spread on to fine linen.—Gauger's *Rep.*, 1842, p. 216.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*On the Composition of the Gases which are disengaged from the Refining Furnaces; on the Carbonization of Wood; and on the Production and Employment of Combustible Gases in Metallurgy.*  
By M. EBELMEN.

IN the Memoirs which I have the honour to present to the Academy, I have endeavoured to explain the theory of some great metallurgical operations by an investigation of the composition of the gaseous products collected at the various epochs of the process, and in the different parts of the apparatus. Atmospheric air being an indispensable agent in all these operations, the examination of the gases indicates the series of transformations which it undergoes, the application of which is most closely connected with the examination of the calorific effects and the chemical reactions which take place in the furnace. In fact, the oxygen of the air, in becoming converted into carbonic acid, develops a very high temperature, which suddenly decreases by the passing of the carbonic acid into the state of carbonic oxide. Previous to this last change the current of gas is oxidizing; after it has taken place it is possessed of energetic reducing properties.



The object of my first inquiries was the examination of the gas of the blast furnace. The vast dimensions of these metallurgic apparatus allowed me to determine in an exact manner the variations which the gaseous column traversing the blast furnace undergoes, and thence to deduce the nature of the corresponding chemical reactions. With the same object in view, I studied another operation which is performed on a great scale in France, the conversion of cast into malleable iron in a refining furnace fed with charcoal.

In these furnaces the air is forced by one or two tubes (*tuyères*) into the hearth filled with charcoal, in which is placed, in a constant relative position, the cast iron to be refined and the iron to be forged proceeding from a previous operation. The oxygen of the projected air, in passing from the *tuyère* to the *contrevent*, is first changed into carbonic acid, and then into oxide of carbon. The analysis of the gases collected in the funnel of the forge shows that the transformation of the oxygen into carbonic acid corresponds with the constant position in which the workman places the iron intended to be forged, and which is the spot where the temperature is highest.

The atmosphere which surrounds the cast iron during its fusion contains scarcely any carbonic acid, and its decarbonizing action must be nearly null, contrary to the opinion generally admitted on the authority of M. Karsten, who attributes the decarbonization which ensues during the fusion of the cast iron to the action of the air. It is to the protoxide of iron of the scoria that this reaction should be exclusively attributed. Dulong's experiments on the heat of combustion prove that this decarbonization must occasion a considerable absorption of latent heat.

In the second period of refining, or what should properly be termed the work, I was easily enabled to deduce, from an analysis of the gases, that an oxidation of a considerable portion of iron was due to the oxygen of the projected air.

The sensible heat and the heat of combustion of the gases of the refining furnaces being employed in a great number of operations, I determined their mean composition at different periods of the process; and I was thus able to prove that this heat could not really be applied in operations which require a high and constant temperature.

I have since examined what takes place in another great operation of the arts, the carbonization of wood. The various methods of performing this operation may be reduced into two classes. In one the distillation is effected in close vessels, and the results are in every respect comparable to those obtained in numerous experiments of the laboratory. In the second class should be reckoned all those processes of carbonization by incomplete combustion, in which a portion of the combustible matter is sacrificed in order to distil the other. Nearly all the charcoal is prepared in France by a process of this kind, which is known by the name of *process of carbonization in heaps* (*meules*). The wood is arranged in conical heaps of variable size, which are covered over with a thick layer of earth and of coal-ash; the heap is kindled from the centre, where a cavity has been



kept open for that purpose, and which descends to the base. In this cavity burning charcoal is placed and some small pieces of wood, and the air is admitted by holes formed at the base and over the whole circumference of the heap. After some hours, during which the central cavity or chimney is allowed to remain open in order to determine a more active combustion, the superior orifice is shut, and the carbonization is directed from above downwards, by piercing holes in the covering nearer and nearer to the base of the heap, as the operation advances.

The theory of this important operation was still far from being correct in all its details. It was not known whether the oxygen of the air introduced by the apertures was converted into carbonic acid or into the state of carbonic oxide, whether the combustion took place at the expense of the charcoal already formed, or of the products from the distillation of the wood. These were the chief questions which I aimed at resolving. On examining the composition of the gaseous products of the apertures for the exit of the gases, and comparing it with that of the gases obtained from the carbonization in closed vessels, I came to the two following conclusions, which evidently result from my experiments, and which appear to me fundamental for the theory of the operation:—

1. The oxygen of the air introduced by the draught-holes is entirely changed into carbonic acid, without any mixture of carbonic oxide.
2. This oxygen acts solely on the already-formed charcoal, and its action is quite null on the products of distillation.

The comparison of the results of carbonization in heaps, with those obtained by throwing cold air into a wind-furnace fed with wood in its natural state, led me to a direct verification of the fact which I had deduced from Dulong's experiments, that is to say, an absorption of latent heat in the conversion of carbonic acid into carbonic oxide. The wood becomes carbonized in a certain zone of the wind-furnace, and I ascertained that the oxygen of the air was completely changed into carbonic oxide before reaching the region where distillation takes place. The temperature of the gases, and of the products of distillation which come from the furnace, is very little above  $212^{\circ}$  Fahr., and we may thence conclude, that the distillation of the wood absorbs a quantity of latent heat nearly equal to the heat developed by the conversion of the remaining carbon into carbonic oxide.

In the wind-furnace, the distillation of 1 part of the volatile substances corresponds to 0.212 of carbon changed into carbonic oxide. In the charcoal heaps (meules) 1 part of volatile substances is distilled over by consuming 0.0535 of carbon, which is converted into carbonic acid. This result clearly proves that there is an absorption of heat and a decrease of temperature in the transformation of carbonic acid into carbonic oxide.

The results obtained by burning wood in a wind-furnace give a very satisfactory explanation of the circumstances observed in the rolling of blast furnaces, in which the employment of this combustible in its raw state has been tried.



The third memoir contains the results of a number of experiments executed in the forge of Audincourt (Doubs), at the expense of the state. I endeavoured to ascertain whether it would not be an advantage, in a great number of cases, to convert the solid combustible into gas, in order to burn this afterwards by means analogous to those already employed with regard to the gases of the highly heated furnaces.

The experiments already made relate particularly to combustibles of vegetable origin, charcoal, wood and turf. The following is a summary of the principal conclusions which may be drawn from them:—

1. Small coal, the live coal, the *débris de halle*, may be employed to produce gases, consisting essentially of a mixture of carbonic oxide and of nitrogen, which are able to develop the highest degrees of temperature necessary for metallurgical processes in the reverberatory furnace.

This conclusion has been deduced, not only from the analysis of the gases, but also from experiments made on a great scale in a furnace for welding iron, which acted during the whole time of the experiments with great regularity. A generator of gas, similar to that which I had caused to be constructed for these experiments, is now in constant use, in the works of Audincourt, to heat a furnace for sheet iron.

2. By employing a mixture of air and steam to feed the combustion in the generator of gas, results are obtained which are quite in accordance with those deduced from Dulong's experiments, and prove that the decomposition of the steam takes place on contact with the incandescent coal, by determining a great absorption of latent heat. The quantity of steam which may be introduced with the air into the generator is necessarily limited by this fact; it depends on the temperature of the air and of the steam. On employing rather an excess of the latter, a portion is found to pass through the coals undecomposed, whilst the other constantly gives rise to a mixture of hydrogen and carbonic acid.
3. The composition of the gases produced from the air and wood seemed to me to place beyond doubt the advantage which the combustion of the gases from the wood would have over direct combustion, after condensation of the liquid products of distillation. These lower the temperature of combustion considerably, and consequently determine a much greater consumption of combustibles; accessory products will also be obtained, such as pitch and acetic acid, the importance of which should be taken into consideration.

By burning the wood in a peculiar furnace, which I call generator *à combustion renversée*, it is easily converted into a gas containing about 37 per cent. of hydrogen and of carbonic oxide, and in which the products constituting the smoke have entirely disappeared. This apparatus is constructed so as to force the products of distillation to pass under the vent of the tube, and to pass through a rather long



column of incandescent coal. It might, I think, be rendered useful in some other operations of the arts.

4. The composition of the gases produced by turf, in a generator, where the combustion is direct, differs from the gases of the wood in this, that the coal of turf does not convert the oxygen of the air into carbonic oxide as rapidly as charcoal does; there are great differences in this respect between the various kinds of coal. I have shown on what the differences observed in the calorific effects produced by the different combustibles depend, particularly with coke and with charcoal, when they are employed either in the great metallurgic furnaces or in laboratory furnaces. The explanation to which I have been led completely differs from that received up to the present time; it is based on this fact, that all combustibles do not convert carbonic acid into carbonic oxide with the same rapidity. The more the zone in which this transformation takes place is elevated, the more the point of the maximum of temperature is extended.

The principal advantages which the transformation of the combustibles into gas present, appear to me to be the following:—

1. In the apparatus which I have described we may use combustibles very much charged with earthy matters, and obtain from them gases whose composition and calorific power are nearly independent of the proportion of cinders.
2. Combustibles which give long flames, as wood and turf, may be transformed into gas, whose combustion, after the condensation of the liquid products of distillation, will develop a much higher temperature than that produced by direct combustion.
3. In short, the use of gas allows of heating the combustible and the air with the lost heat of the furnaces, and to obtain in this manner much higher temperatures than with a combustible and cold air, and consequently to turn to account a much greater proportion of the heat produced in metallurgic apparatus.

I propose extending the experiments, the first results of which I submit to the Academy, to the different combustible minerals, particularly to those charged with earthy matters and the anthracites.  
—*Comptes Rendus*, April 10, 1843.

*On Lord Stanhope's Composition for covering Roofs.*

*By* PETER HOGG.

The mixture invented by Lord Stanhope, and used by the late Mr. Nash, for covering the nearly flat fire-proof roofs of Buckingham Palace, is described in the paper as being composed of Stockholm tar, dried chalk in powder, and sifted sand, in the proportions of 3 gallons of tar to 2 bushels of chalk and 1 bushel of sand, the whole being well boiled and mixed together in an iron pot. It is laid on in a fluid state, in two separate coats, each about three-eighths of an inch in thickness, squared slates being imbedded in the upper



coat, allowing the mixture to flush up between the joints the whole thickness of the two coats, and the slates being about an inch.

The object in imbedding the slates in the composition is to prevent its becoming softened by the heat of the sun, and sliding down to the lower part of the roof, an inclination being given of only  $1\frac{1}{2}$  inch in 10 feet, which is sufficient to carry off the water when the work is carefully executed. One gutter or water-course is made as near to the centre as possible, in order to prevent any tendency to shrink from the walls, and also that the repairs, when required, may be more readily effected. It is stated, that after a fall of snow it is not necessary to throw it from the roof, but merely to open a channel along the water-course, and that no overflowing has ever occurred; whereas with metal roofs it is necessary to throw off the whole of the snow on the first indication of a thaw.

These roofs have been found to prevent the spreading of fires, and it is stated, that on one occasion, to test their uninflammability, Mr. Nash had a bonfire of tar-barrels lighted on the roof of Cowes castle.

Another advantage is stated to be, the facility of repair which the composition offers, as, if a leak occurs, it can be seared and rendered perfectly water-tight by passing a hot iron over it; and when taken up the mixture can be remelted and used again.

The author proposes to obviate the disadvantage of the present weight of these roofs, by building single-brick walls at given distances, to carry slates, upon which the composition should be laid, instead of filling the spandrels of the arches with solid materials, as has been hitherto the custom.—From the *Proceedings of the Institution of Civil Engineers*.

## PATENTS.

*Patent granted to Frederick Theodore Philippi, Belfield Hall, Lancaster, for certain Improvements in the Production of Sal-ammoniac, and in the Purification of Gas for Illumination.*

THE chief object of this invention is to purify coal-gas, by removing from it, by means of a double chemical decomposition, all the ammoniacal substances with which it is combined, and at the same time separating from it a large quantity of naphtha or naphthaline, both of which substances render its smell very disagreeable. Ammonia is found in coal-gas, combined with hydrosulphuric acid, carbonic acid, sulphurous acid, hydrocyanic acid, hydrosulphocyanic acid, &c. Now if the gas is subjected to the action of a saline metallic solution, for instance of manganese, iron, zinc, copper, lead, antimony, &c., the result will be a double decomposition, the formation of a metallic sulphuret or carbonate, sulphite, cyanuret, &c., which will be precipitated, whilst the ammonia will be held in suspension by the solution employed. The sulphate or chloride of manganese is



preferred to be used in the formation of the solution on account of its cheapness. The solution should not be acid, as that would cause a decomposition of the hydrosulphates, carbonates, &c. and the disengagement of the acids. It is rendered neutral by using the condensed ammoniacal water from the gas-works, and should be reduced by this means to the strength of 20° Beaumé. In order to obtain the double decomposition, the gas is passed through the solutions mentioned above, contained in suitable cisterns or apparatus. This apparatus consists of three cisterns or wash-boilers, one placed higher than the other; through these the gas passes, and is washed. The cisterns or wash-boilers are cylindrical, and made of wrought or cast iron; the lids should be so much above the level of the liquid that the bubbling due to the passage of the gas should not reach them; they should be easy of removal and be closed with a water-joint.

The pipes for admitting and letting off the gas are placed at the side, and the remark made with reference to the distance of the lids is partly applicable to the letting-off pipes, which might be covered by the precipitate. If preferred, the lids may be fixed, and provided with a man-hole for inspecting and cleansing the cistern. The pipe for admitting the gas descends at least two inches below the surface; the gas is separated in its passage in order to increase the surfaces of contact, and this is effected by perforated plates of metal, or other like partitions. There is in each cistern an agitator, which is so constructed as to put in motion all the deposit, particularly at the bottom and sides of the apparatus, when the cistern is to be emptied. The pipes and taps for emptying should be large, and capable of being removed when necessary. There is an escape-pipe attached to each cistern, to prevent an increase of pressure in case the level of the liquid should by any cause ascend; the escape-pipe conducts the liquid into the lower cistern. The gas is allowed to pass through the cisterns until the liquid in the first, instead of being precipitated by means of a hydrosulphate, contains an excess of ammonia, as in the ammoniacal or condensed waters. To find out this point of saturation, a small quantity of the solution is drawn from the cistern by a little tap. The liquid of the first cistern being saturated, it is drawn off, the second cistern is emptied into the first, the third into the second, and the third has a fresh supply of the solution introduced. The cisterns are connected by pipes, and they are made in such a manner as to allow of being cleaned. The solution from the first cistern is received into a vat, in which it forms a deposit; the liquid part is withdrawn, acted upon by a little sulphuric, hydrochloric, or other acid, according to the nature of the salt which saturates the ammonia, and then it is evaporated to crystallize. This process is also applicable for removing the ammoniacal substances which are disengaged during the distillation of bones or other animal substances, and all such as produce ammonia by the action of heat. Naphtha or naphthaline, which is found in distilling coal, is naturally volatile, and becomes more so in the presence of ammonia; there is



a sort of affinity between ammonia and naphtha, which is destroyed when the ammonia is absorbed; the naphtha or naphthaline then floats on the liquid, or else it remains in the precipitate. In applying the process of purifying to gas, the gas should be cooled, and a great part of the tar and ammoniacal water should be condensed.

Ammoniacal waters, besides the uses specified above, may also be advantageously employed for obtaining ammoniacal substances in the following manner:—These waters are acted upon by lime in a common distilling apparatus, heated either by steam or otherwise, by means of a worm or injection; the alkali or ammonia set at liberty by the heat escapes into a second boiler, similar to the first one, through a connecting pipe. The condensing of the ammoniacal vapours heats the second boiler, in which there is lime and ammoniacal waters. The vapours emitted from the second boiler pass into a good-sized vessel, or a third boiler, in which there is a solution of lime; this solution absorbs the remaining parts of the acid which have not been taken up by the first two boilers. After the third boiler, there is a leaden worm in which the vapours circulate; this worm is surrounded by cold ammoniacal water, and descends into a leaden vessel, in which is deposited a solution of alkali, which at first is very strong, but becomes weaker as the distillation goes on. This alkali should be withdrawn before it descends below the  $220^{\circ}$ ; but as a part of the ammonia is in a gaseous state, there are two other vessels prepared after the first one, the whole of which forms, or is similar to one of “Woulfe’s apparatus.” The solution of lime of the second vessel, which is not saturated after one distillation, is put into the second boiler, that the lime and ammonia which are dissolved in the liquid may be used. This alkali may be sufficiently pure for commerce, but if it should be changed into salt, sulphate, or hydrochlorate, it must be poured into sulphuric or hydrochloric acid by means of a pipe in which small holes are bored horizontally; but it is necessary in this case to collect the vapours in a second vessel also containing acid. It is even more advantageous to introduce the alkali into the acid in proportion as it comes from the worm of the still. The action of the acid on the alkali liberates a certain quantity of empyreumatic oil, which is partly carbonized, and which discolours the liquor. This may be avoided by allowing the liquor to repose or to dry up before it is evaporated to crystallize. If the alkali is not pure enough for commerce, it is distilled again on lime, potash or soda. For obtaining the hydrochlorate, some hydrochloric acid gas may be introduced, before it is condensed, into the mixture, and instead of using water to condense, the alkali in question may be used by avoiding evaporation; there may be also introduced into a leaden chamber some alkaline vapours and hydrochloric acid; the connexion is formed, and the salt deposits itself against the sides in the form of powder. In substituting carbonic acid for hydrochloric acid gas, carbonate of ammonia is formed. Instead of the alkali thus obtained, the ammoniacal waters may be used for condensing the hydrochloric acid gas, and thus



hydrochlorate is produced. These remarks about the ammoniacal condensing waters for gas, are also applicable to all liquids containing ammoniacal or volatile salts, &c.—Sealed July 21, 1842.

*Patent granted to Charles Robert Ayers, John Street, Berkeley Square, for Improvements in ornamenting and colouring Glass, Earthenware, Porcelain and Metals.*

These improvements consist in ornamenting glass, &c. by the application of colour, in the state of powder, through perforated screens of metal, or other suitable material, or through lace, or other open fabric, in a similar manner to stencilling; or by impressing a design upon the glass, by means of an engraved or ornamented block, with any suitable adhesive matter, and then depositing the colour upon it.

The mode of colouring glass, &c. by means of perforated screens or open fabrics is as follows:—A coat of adhesive matter (the patentee prefers essence of lavender) having been applied to the glass or other substance with a soft brush, the screen or open fabric is laid over it; the pulverized colour is then deposited upon the screen, which with the superfluous colour is afterwards carefully removed, leaving only that portion of the colour which has found its way through the perforations and adheres to the glass; the colour is then permanently fixed by “firing” as usual.

When wooden or other blocks are used, the design is printed with adhesive matter upon the substance to be ornamented, and the colour is dusted upon it; those portions of colour which are not deposited on the adhesive matter, constituting the design, are then removed by means of a pair of bellows, or in any other convenient way, and the remainder of the colour is fixed by the “firing” process.

If it be required to ornament a convex or other surface not flat, yielding-screens or patterns are employed, such as ornamental lace or perforated paper-screens; these are employed as before directed, and, being left on the article, are consumed during the fixing of the colour.

The colours used in colouring glass and china by this process are, in all cases, those generally employed for the same purpose; and the method of applying colour which the patentee prefers is by agitation in a closed box, so as to cause it to be held in suspension; the article being then placed at the bottom of the box, will receive an even deposit of colour.—Sealed July 23, 1842.



# THE CHEMICAL GAZETTE.

No. XVIII.—July 15, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Artificial Formation of Butyric Acid.* By MM. PELOUZE  
and GELIS.

BUTYRIC acid was discovered in 1814 among the products resulting from the saponification of butter, by M. Chevreul, who described its history with much care in his work on the fatty bodies of animal origin. Since this period butyric acid has not been the object of any considerable investigation, which without doubt is attributable to the difficulties of preparing it, which are such that even at the present day butyric acid is one of the rarest substances in chemical laboratories.

M. Simon described some of the properties of butyric æther, but he does not appear to have obtained it in a pure state. M. Bromeis has recently repeated, in the Giessen laboratory, the analysis of the butyrate of barytes on some beautiful crystals of this salt furnished by M. Chevreul himself to M. Liebig.

Again, M. Nöllner has described, under the name of *pyroacetic acid*, a peculiar acid derived from the spontaneous fermentation of tartrate of lime. M. Berzelius, to whom M. Nöllner had sent a specimen of the pseudo-acetate of lead, found that the acid discovered by that chemist was a mixture of acetic acid and butyric acid.

On repeating the experiments of M. Fremy, on the remarkable modification which sugar undergoes in the presence of animal membranes, and those of MM. Boutron and Fremy on lactic fermentation, we obtained several curious results. If indeed the transformation of milk into lactic acid by the influence of caseine is sometimes simple and complete, more frequently, and without its being requisite to operate under conditions different from those pointed out by those chemists, far more complicated reactions are observed.

All substances which are able to furnish lactic acid have the same composition as that acid, or if they differ, it is solely in their containing a little more or less water; the lactic fermentation consists therefore in a simple molecular change, with or without the fixation of water, but always without any disengagement of gas; and nevertheless, in a large number of cases, we have observed it to become effervescent, as in the vinous fermentation, and what is very remarkable, we have constantly found free hydrogen among the gaseous products.



This fact called to mind an observation of M. Desfosses, which had hitherto remained without explanation. This chemist had proved the existence of a slight disengagement of hydrogen in analogous fermentations; but as in our experiments we sometimes obtained this gas in very considerable quantity, we sought the cause of its formation, and were so fortunate as to discover that it was due to a new fermentation, during which, in the place of the sugar which disappears, we observed the formation of one of the products of the organization of animals, viz. an acid contained in butter, in fact butyric acid itself.

This observation will necessarily occupy an important place in the present discussion on the formation of fat in animals. Without wishing to prejudge of the means which nature employs in the numerous modifications which she causes the aliments to undergo, we cannot refrain from observing, that the change of sugar into butyric acid is effected without the intermediation of any considerable elevation of temperature, without the employment of any of those energetic reagents which are susceptible of destroying the equilibrium and the vitality of the animal economy, but that this transformation takes place, on the contrary, under very simple conditions, and with the very substances which nature herself presents.

If this argument has some appearance of being well-founded, it will be conceived that it may also apply to the ordinary fat acids relative to butyric acid and the sugars, and likewise to starch, which in many respects is allied to the latter class of bodies.

After several experiments as to the best process of obtaining from sugar the largest amount possible of butyric acid, we adopted the following:—

A small quantity of caseine is mixed with a solution of sugar indicating  $10^{\circ}$  on the saccharometer, and sufficient chalk to saturate the whole of the butyric acid which subsequently forms. This mixture is left at a constant temperature of  $77^{\circ}$  to  $86^{\circ}$  F.; it soon undergoes very considerable alterations; the fermentation, at first viscous, subsequently lactic, gradually becomes butyric; these decompositions are sometimes successive, sometimes simultaneous, without its being possible to regulate their course. The disengagement of gases becomes more abundant, and on submitting them to analyses, a moment arrives when the free hydrogen amounts to a third of the volume of the carbonic acid. At this period the butyric fermentation is in all its vigour; when at last, at the end of some weeks, all disengagement of hydrogen has ceased, the operation is at an end, and the solution contains, so to say, nothing further than butyrate of lime.

Having observed that the transformation of the sugar into butyric acid was effected more readily when the masses operated on were considerable, we submitted to fermentation such quantities of sugar that we were able to obtain from 20 to 25 kilogrammes of butyrate of lime.

The extraction of the pure butyric acid from the butyrate of lime is very easy; it is effected in the following manner:—



1 kilogramme of butyrate of lime is suspended in 3 to 4 kilogrammes of water, to which have been added from 300 to 400 grms. of commercial hydrochloric acid. This mixture is introduced into a distilling apparatus, and boiled until about 1 kilogrm. of distilled liquid has been obtained. This liquid is a mixture of water, butyric acid, and a small quantity of hydrochloric and acetic acids. It is placed in contact with chloride of calcium, which determines the formation of two liquids of different density. That which forms the upper stratum is butyric acid; the more dense contains the other substances. This upper layer is removed, and submitted to distillation in a tubulated retort provided with a thermometer. The first portions which pass over into the recipient are more or less aqueous; the boiling point, at first very low, gradually rises to  $327^{\circ}$ , at which temperature it remains nearly stationary. This is a sign that the acid which distils over is concentrated; it is received apart, continuing the distillation until the retort contains but a small quantity of acid mixed with a little colouring matter, some chloride of calcium, and butyrate of lime.

The acid is now kept for some time at its boiling point, to deprive it of some traces of hydrochloric acid, and is then redistilled, when it is obtained perfectly pure.

The first portions which passed over are not lost; they may be employed in the preparation of the butyrates, or a fresh quantity of concentrated butyric acid may be obtained by mixing them with chloride of calcium.

#### *Composition of Butyric Acid.*

M. Chevreul did not analyse butyric acid in its free state, but only in combination with the metallic oxides; and he deduced from his analyses the atomic formula  $C^8 H^{5\frac{1}{2}} O^3$  for the acid as it exists in the anhydrous butyrates, for instance in that of lead. M. Berzelius proposed to substitute for the preceding the formula  $C^8 H^5 O^3$ , in order to get rid of the half atom of hydrogen which it presents. M. Bromeis was led to a different result; he admits the formula  $C^8 H^6 O^3$ .

We believe that neither of the above three formulæ are correct, and that the atomic numbers  $C^8 H^7 O^3 + HO$ , which represent the monohydrated butyric acid, should be substituted. The analyses which have served to establish this composition were made with the greatest care, and controlled in various ways. They agree with the composition of the butyrate of silver, of butyric æther, and of the butyrate of the oxide of methyle\*.

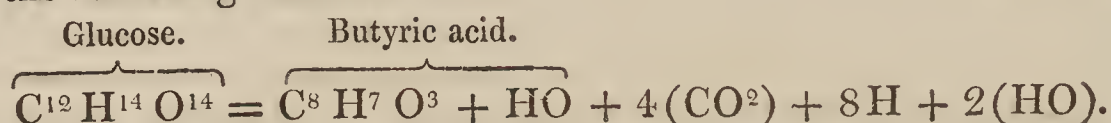
We must not forget to add, that M. Chevreul placed beyond doubt the relation of 1 to 3 between the oxygen of the bases and that of the butyric acid in the series of neutral butyrates, and that he had also rendered probable the existence of 8 atoms of carbon in each atom of acid.

The composition of butyric acid, its proportion, which amounted in

\* Free butyric acid is isomeric with acetic æther and aldehyde. We endeavoured in vain to produce it with the first of these substances.



several experiments to above the third of the weight of the sugar, the liberation of free hydrogen and of carbonic acid (independent of that which is disengaged from the lime), admit of our supposing that under the prolonged influence of ferments sugar is decomposed in the following manner:—



It is evident that this formula only represents the final result, for several fermentations precede, as we have already stated, the formation of the butyric acid.

The properties of free butyric acid have been described with great accuracy and care by M. Chevreul, so that it was easy for us to convince ourselves of the identity of the acids resulting, on the one hand, from the saponification of butter, and on the other from the fermentation of sugar. Nevertheless, to leave no doubt in this respect, we compared our acid with a certain quantity of butyric acid which we had for this purpose extracted from butter. We could not detect the slightest difference between the two.

Butyric acid is a perfectly colourless, transparent liquid of great fluidity, of an odour which calls to mind at the same time that of acetic acid and of rancid butter. It is soluble in every proportion in water, alcohol, and in pyroligneous spirit. It boils at about  $327^{\circ}$  under ordinary pressure, and distils without undergoing any perceptible alteration. Its vapour is inflammable, and burns with a blue flame. A continued cold of  $4^{\circ}$  F. does not produce any change in the state of the butyric acid; its taste is strongly acid and burning; it attacks and disorganizes the skin just as the strongest acids. Its density is 0.963 at  $59^{\circ}$ .

Concentrated sulphuric acid has no effect on butyric acid at the ordinary temperature, but under the influence of a high temperature it shows signs of decomposition; nevertheless the greater portion of the butyric acid distils over. Chlorine changes it rapidly. When a few drops of the liquid are let fall into a flask containing dry chlorine, a large quantity of hydrochloric acid is immediately produced, and the sides of the flask become clothed with a multitude of crystals covered with a viscid liquid of a slightly yellow colour. These crystals are oxalic acid; the liquid is a peculiar acid containing chlorine among its elements. It is nearly insoluble in water, soluble in every proportion in alcohol. Potash, soda and ammonia combine with it and form salts, which are very soluble in water. This chlorated acid will form the subject of a subsequent examination\*.

Iodine dissolves with the application of heat in butyric acid, and separates on cooling. The reaction between these two bodies is very slow and difficult; nevertheless the production of a small quantity of hydriodic acid is perceptible.

\* Butyric acid absorbs chlorine with great facility. This absorption is so rapid when the sun is not hidden by any cloud, that the most violent current of chlorine does not for a long time give rise to the evolution of any of this gas from the vessel containing the butyric acid.



We have little to add to the observations of M. Chevreul on the combinations of butyric acid with the bases. If any doubts had remained as to the identity of the butyric acid extracted from butter with that derived from the fermentation of sugar, they would have been dispelled by the coincidence of our results with those obtained by that chemist.

Butyrate of lime is soluble to a considerable amount in cold water; this solubility diminishes in proportion as the temperature rises, and when at the boiling point nearly the whole of the salt separates in the form of transparent prisms. This property was pointed out by M. Chevreul, and we have confirmed it on the butyrate of lime, derived directly from butyric fermentation, and on the same salt in its pure state. The butyrate of lime easily loses its water of crystallization, and is well adapted for the determination of the capacity of saturation of the acid. Submitted to dry distillation, it affords, among other products, an odorant volatile oil, which has the smell of the essential oils of the *Labiatae*. The production of this oil was indicated by M. Chevreul.

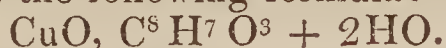
Butyrate of barytes crystallizes readily in long flattened prisms, perfectly transparent, which contain 4 atoms of water of crystallization. Submitted to the action of a temperature lower than  $212^{\circ}$ , it melts into a transparent glass, without losing anything in weight. It produces on the surface of water the same motions as camphor, and with an equal intensity.

The butyrate of potash is deliquescent, but much less than the acetate of the same base. It produces in salts of silver and of the protoxide of mercury, white brilliant needles, which resemble very much the precipitates formed by the acetate of potash in the same salts.

Butyrate of silver may beedulcorated and dried with ease. It is the salt which is best adapted for analysis. Its decomposition by heat takes place without deflagration. The residue of silver, which is left on calcination, is perfectly white and pure in those portions which have been in contact with the air; but to obtain an accurate result the metal must be dissolved in nitric acid, and calcined anew with precaution, as a small quantity of carbon hidden under the layer of silver escapes combustion.

The butyrate of lead, which is obtained on adding butyric acid to a solution of acetate of lead, is precipitated in the form of a colourless liquid of great density. It continues in this state for a long time. It is easily washed by decantation. Dried at  $266^{\circ}$  it consists of 1 equivalent of acid and 1 equivalent of oxide of lead.

Butyrate of copper is very slightly soluble in water; it may be obtained direct, or by double decomposition, on adding a soluble salt of copper to a solution of butyrate of potash. It forms a bluish-green precipitate, which may be crystallized by dissolving it in boiling water. This salt has the following formula:—



It loses 1 atom of its water by the application of heat; the other escapes only when the salt itself is decomposed.



Butyrate of magnesia is very soluble in water. It crystallizes in beautiful white laminæ, which have the micaceous appearance of boracic acid, and contains 5 atoms of water, which are easily expelled by heat.

Butyrate of ammonia is deliquescent, like that of potash.

[To be continued.]

### *Gallic Acid in Menorrhagia.*

Professor Simpson stated, at a recent meeting of the Medico-Chirurgical Society of Edinburgh, that for the last year he had employed gallic acid in some cases of menorrhagia with the most successful results. Like all the other remedies directed against that disease, it had also occasionally failed in his hands. Some of the cases which had completely yielded under its use were of an old standing and aggravated description. He gave it during the intervals, as well as during the discharge, in doses of from 10 to 20 grs. per day made into pills. It has this advantage over most other anti-hemorrhagic medicines, that it had no constipating effect upon the bowels. He was first induced to use it from finding a case of very obstinate menorrhagia get well under the use of Ruspini's styptic, after many other remedies had utterly failed, and from it being alleged that gallic acid was the active ingredient in that styptic. He suggested whether the anti-hemorrhagic properties of some of our common astringent drugs may not depend upon the gallic acid as much or more than upon the tannin which they contain, or upon the tannin becoming changed into gallic acid within the body.

Dr. Douglas Maclagan mentioned, that in one case where he had tried it, without success, it had acted as a diuretic.—*Lond. and Edinb. Monthly Journ. of Med. Science* for July 1843.

### *On the Sugar in the Blood in Diabetes.* By Dr. BENCE JONES.

The very delicate test for grape-sugar which was communicated to the Academy of Science in Berlin, in 1841, by Professor Mitscherlich, as the discovery of M. Trommer\*, was applied by him without success to the examination of diabetic blood. He found however that if  $\frac{1}{10000}$  of grape-sugar was mixed with blood, the test would indicate its presence. An opportunity occurred to the author of this paper, of repeating the experiment on the blood of a diabetic patient of Dr. Nairne's in St. George's Hospital. The disease was of about a year's standing, and the patient was in other respects in tolerable health. On the 24th of January 1843 he was bled to 12 oz. three hours after a dinner of bread and meat. The following morning the blood was well-separated, the serum milky, the clot slightly buffed and cupped, specific gravity 1029·7. The serum became clear when treated with æther, and the test for grape-

\* For a description of this method see Philosophical Magazine, vol. xx. p. 224.—ED.



sugar gave a negative result, as the precipitate which first formed did not redissolve, and only became much darker when heated, partly in consequence of the deep purple colour which is formed by the action of caustic potash and sulphate of copper on fibrin or albumen.

The albumen was therefore removed by evaporating the serum to dryness in a water-bath. The residue was finely powdered, treated with water, filtered, and tested for grape-sugar. The characteristic change then took place. The clot of the same blood was treated in the same way, and the test showed that grape-sugar was present in it also. The urine passed between three hours before the bleeding and nine hours after was 5 pints, spec. grav. 1031·3; and when tested by the same method, the liquid first became blue, and then a very large precipitate formed, which was at first bright yellow, and after some hours became dark green.

Uric acid alone does not form the clear blue solution, although when boiled with the potash and sulphate of copper it will produce the same coloured precipitate as the grape-sugar does.—*Prov. Med. Journal*, and *Dublin Journal of Medical Science*.

*Dangerous Effects of Arseniuretted Hydrogen.* By M. SCHINDLER.

After inhaling about half a cubic inch of the gas, symptoms of poisoning became evident in about three hours, in the form of giddiness, heaviness in the neighbourhood of the kidneys, cold over the whole body, shooting pains in the joints of the knees and cold in the extremities, deadness of some parts, vomiting of a yellow greenish bitter mucus, secretion of a dark red, nearly black urine, intense heat in the abdomen, dark colouring of the skin, bleaching of the hair on the dead parts. Mucous beverages were administered to the poisoned individual, together with *Solutio magnes. sulphuric.*, and *Tinct. opii crocata*. It was seven weeks before the recovery was perfect.—Gräfe and Von Walther's *Journ.*, xxvi.

*On Euphorbic Acid.* By M. RIEGEL.

The author discovered the above new acid in an examination of *Euphorbia Cyparissias*. In order to prepare it, the flowering plants, freed from the root and the solid parts of the stem, were pounded with some dilute acetic acid; the expressed juice warmed, to separate the chlorophylle, and filtered; the clear solution was precipitated with ammonia, the sediment collected on a filter, and the clear liquid, somewhat concentrated by evaporation, rendered slightly acid with nitric acid, and treated while warm with nitrate of lead. On cooling, a considerable quantity of euphorbate of lead had separated in indistinct crystals, which were washed with a little cold distilled water to remove any adherent acid, then dissolved in boiling water, and the solution decomposed with sulphuretted hydrogen. The sulphuret of lead formed is heated with the liquid, and is afterwards exhausted with boiling water. The clear filtered liquid



is purified by digestion with animal charcoal, and the acid is then obtained by slow evaporation in tolerably white acicular crystals or in verrucous groups. It is void of smell, has an acid taste and reaction, is easily soluble in water, with more difficulty in alcohol. With potash it affords a salt, in white tabular crystals, of a saline, mild taste, which is slightly deliquescent, and is easily soluble in water. With soda and ammonia it likewise gives easily soluble crystalline compounds. The dilute solution of the acid produces with basic and with neutral acetates of lead white precipitates, with barytic water a white precipitate soluble in nitric acid, and with nitrate of silver a white precipitate soluble in nitric acid and in ammonia. The proto- and per-salts of mercury are thrown down of a white, and sulphate of copper of a greenish-white colour. The solution of the potash-salt precipitates protochloride of tin white, and also lime-water, lime-salts, and solution of tartar-emetic; solution of protosulphate of iron greenish-white, and perchloride of iron isabella-yellow.

The liquid from which the euphorbic acid had been removed by a lead salt, and freed from lead by sulphuretted hydrogen, afforded a precipitate with tincture of galls, which was digested at a gentle heat with moist hydrate of lime and alcohol; carbonic acid was then passed through the alcoholic extract to remove the lime, and the alcohol evaporated. The residue was then treated with a little water, which on evaporation left behind a small quantity of a white substance (alkaloid?).—*Jahrbuch für Prakt. Pharm.*, vi. p. 165.

*Process for obtaining crystallized Protoxide of Lead having the Colour of Minium. By Mr. CALVERT.*

I observed that when boiling soda, indicating from 1.42 to 1.48 sp. gr. was saturated with hydrate of the protoxide of lead, and the liquid allowed to cool, an oxide of lead of a rose colour crystallized from it in tolerably regular cubes. Heated to about 752° F. this oxide increases in volume, becomes black and decrepitates, giving off traces of water (1 per cent.); if the temperature be raised to a cherry-red it assumes a sulphurous yellow colour, without losing its crystalline form. It is very little soluble in acids; nitric acid, strong or weak, dissolves it with great difficulty. Pulverized, it affords an orange-yellow powder, analogous to that of litharge. On analysis, in which the 1 per cent. water of interposition was taken into account, it was found to be composed of 92.83 lead and 7.17 oxygen. In fact 1.519 lost 0.109 oxygen, or 7.17 per cent.

The hydrogen employed in my analyses had been purified and dried by the processes adopted by M. Dumas in his analyses for determining the composition of water.

If, instead of taking soda of 1.42 to 1.48 sp. gr. this caustic alkali be fused, and the hydrate of the protoxide of lead be conveyed into it, it instantly becomes red, giving rise to a new isomeric protoxide. This new oxide is an amorphous substance, possessing a colour similar to that of minium; triturated, it affords a yellowish-red powder, resembling that furnished by the rose-coloured oxide, but it differs



from this latter in being very soluble in acids. Between  $552^{\circ}$  and  $752^{\circ}$  it becomes reddish-brown without changing its tint on cooling, and above  $752^{\circ}$  it acquires a sulphur-yellow colour as the temperature decreases. This oxide may be obtained anhydrous, but it is with difficulty deprived of its hygrometric water. On analysis it afforded numbers representing the composition of the protoxide; 1.504 lost 0.108 oxygen, or 7.18 per cent.

It is very curious that potash of 1.48 spec. grav. should act on the hydrate of the protoxide of lead in excess in the same manner as fused soda, while soda of 1.48 spec. grav. does not afford the same result.

On dissolving hydrate of protoxide of lead in potash of 1.48 spec. grav. to saturation I obtained a third oxide, which appears to have been investigated by M. Mitscherlich.—*Comptes Rendus*, June 19, 1843.

*On the White Protochloride of Gold.* By ALPHONSE MEILLET.

The peculiar reaction which ensues when chloride of gold is prepared for fixing photographic images has been little attended to. 1 grm. of hydrochlorate of the chloride of gold (chloride of gold of commerce) is dissolved in a pint of water, and in another vessel 3 grms. of hyposulphite of soda in the same quantity of water, and the chloride of gold gradually added, with constant stirring, to the hyposulphite. When, on the contrary, the solution of the hyposulphite is conveyed into that of the gold, decomposition results, the liquid becomes black, and sulphuret of gold is precipitated.

When the operation has been correctly performed, the solution is instantly decolorized. This change of a salt naturally highly coloured in presence of a neutral salt deserved some attention. I conceive the reaction to be as follows:—On pouring a solution of the hydrochlorate of chloride of gold into the hyposulphite of soda, the hydrochloric acid displaces a certain amount of hyposulphurous acid, which is immediately decomposed into sulphur and sulphurous acid; the sulphur is redissolved by the undecomposed hyposulphite, which, as is well known, is able to take up a great excess of it; the sulphurous acid attacks the chloride of gold, and reduces it to the protochloride, being itself converted into sulphuric acid, and subsequently into sulphate of soda. It has been asserted that a hyposulphite of gold is formed, but analysis proves the contrary. To obtain this salt some chloride of gold is dissolved in a solution of hyposulphite of soda, filtered to remove the small quantity of precipitated sulphur, and evaporated to the consistence of a very clear syrup; it is then placed in a dish under a bell-glass containing lime, and its evaporation completed. Several very different salts crystallize from the solution, for instance chloride of sodium in very distinct cubes, and also prisms of the sulphate and of the hyposulphite of soda; the chloride crystallizes in the intermediate spaces in minute needles. It is separated as much as possible from the other salts, especially from the chloride of sodium, and digested in the cold with alcohol



of 0·833 spec. grav. Only the chloride of gold dissolves ; it is filtered and allowed to evaporate spontaneously, when it is obtained in very white, minute, acicular crystals.

This salt is not precipitated by the proto-salts of iron, mercury or tin ; only the alkaline hydrosulphates throw it down in the state of a bright yellow protosulphuret ; it does not colour the skin, and has a very slight taste, quite different from the metallic and disagreeable taste of the chloride of gold. In fact it does not offer any of the reactions of the other salts of gold. I shall subsequently investigate its medical properties compared with those of the ordinary salts of gold. On analysis this salt furnished in 100 parts—

Gold .....	50·715
Sodium .....	11·788
Chlorine .....	37·497

Supposing it to be formed of 1 atom of protochloride of gold and 1 atom of chloride of sodium, we should have—

Chloride of gold. . 67·200 = Chlorine. . 16·485; gold. . 50·715

Chloride of sodium 32·800 = Chlorine. . 21·012; sodium 11·788

And the salt would be represented by the formula—



*Journ. de Pharm.*, June 1843.

*On a Combination of Hydrated Cyanic Acid with Hydrochloric Acid. By M. WÖHLER.*

This body was accidentally obtained in an experiment made with the view of preparing cyanic acid by decomposing cyanate of potash with muriatic acid gas. When the well-dried salt is placed in a long tube, or in a tubulated retort, and the gas, dried by chloride of calcium, passed over it, it gives off much heat, and a colourless liquid distils over, differing from cyanic acid in its not being instantaneously decomposed, but keeping for several days in closed vessels. When the salt is heated in the gas this liquid is not formed. Much cyamelide (insoluble cyanuric acid) is always formed along with it, which remains behind on the solution of the chloride of potassium in water. Cyanate of silver appears best adapted for the production of this compound.

It is a colourless liquid, which fumes strongly when exposed to the atmosphere, of a powerful odour, in which is recognized that of cyanic acid and of hydrochloric acid. In a moist atmosphere, on breathing on it, it immediately begins to effervesce and to froth, being converted into carbonic acid and a solid substance, sal-ammoniac. It is decomposed by water with a violent evolution of heat and disengagement of carbonic acid gas. The solution is found to contain only chloride of ammonium. It is decomposed by alcohol, likewise with great evolution of heat, into hydrochloric acid and cyanuric æther. On being heated alone, it is converted into hydrochloric acid and cyamelide. This is the reason why it is not obtained on the application of heat in its preparation, or when the salt becomes of itself too hot. In a narrow sealed tube it may be preserved at 32° Fahr. unaltered ;



at the usual temperature it gradually solidifies, but very slowly, to a crystalline mass, which consists of sal-ammoniac and cyamelide, while carbonic acid and hydrochloric acid gas are set free, and are compressed nearly to the point of condensation.

These properties might all belong to a mere solution of hydrochloric acid in hydrated cyanic acid, but the constant composition which this body possesses speaks against this supposition. From the mode of its origin, and the manner in which it is decomposed by water, it might be a combination of 1 atom of cyanic acid, 1 atom of water, and 1 equivalent of hydrochloric acid; it ought then to contain 44.4 per cent. chlorine. Two determinations of the chlorine, with substance prepared at different times, afforded 45.0 and 44.04 per cent. chlorine.

In the first analysis, 0.2395 grms. of the substance, decomposed with water, gave 0.437 chloride of silver = 45.0 per cent. chlorine; in the second, 1.025 grms. substance afforded 1.830 chloride of silver = 44.04 per cent. chlorine. In order to remove all excess of hydrochloric acid, dried hydrogen gas was previously passed through the vessel in which it had been collected. It was then filled by suction into very thin weighed glass bulbs, which were then sealed, weighed, and placed in a closed vessel in water, and broken by shaking.

The empiric formula for the composition of this body would accordingly be  $C^2NO, aq + HCl$ . For the present I leave undecided whether its true mode of composition is expressed by this formula, as such a combination of an oxyacid with a hydracid is as yet without an example. It might with more probability be regarded as a combination of chloride of cyanogen with 2 atoms of water =  $C^2NCl + 2aq$ . But this view is opposed to the circumstance, that the chloride of cyanogen has the property of not being readily decomposed by water, while this compound is instantaneously decomposed by it; nor does its odour call in the least to mind that of the chloride of cyanogen.

Cyanate of silver, brought into contact with sulphuretted hydrogen, evolved a considerable quantity of heat, and was converted into sulphuret of silver and cyamelide. There still remains to be seen whether analogous compounds may not be produced with hydriodic and hydrobromic acids.—*Ann. der Chem. und Pharm.* for March.

*On the Employment of Pomatum of Chloro-ioduret of Mercury, and on the Nature and Preparation of this Product.*

M. Recamier conceived the idea of employing a pomatum obtained by uniting the iodide and chloride of mercury. He states that he has obtained the most advantageous effects from this preparation in resolving the tumours of the breast. The following is the formula which he adopts:—

Chloro-iodide of mercury, 20 centigrms.

Auxungia or cerate, without water, 20 grs.

Mix with the greatest care.



Each day one or two frictions are made with a gramme of this pomatum.

The process employed in the pharmaceutical laboratory of M. Caventou for the preparation of the chloro-iodide of mercury is as follows:—

Take biniodide of mercury and bichloride of mercury in equal portions; dissolve the bichloride of mercury in a sufficient quantity of alcohol of 0.951 spec. grav. The biniodide is then added, which partly dissolves in the alcohol with the assistance of the bichloride; the product is evaporated in a capsule, and a pulverulent residue is thus obtained of a red colour. The nature of this product is evidently complicated. If we dissolve in boiling alcohol, the proportions indicated of bichloride and biniodide of mercury, two distinct products are obtained on cooling, and by spontaneous evaporation of a portion of the alcohol,—1st, yellow crystals, resulting from the combination of the iodide of mercury with the chloride; 2nd, small microscopic crystals of biniodide of mercury. It is evident therefore that the salt employed by M. Recamier is a mixture of the bichloro-iodide and of the biniodide of mercury. Whatever its constitution may be, this salt is one of the most energetic mercurial compounds; it is certainly more active than either of the component salts taken separately.

Two definite combinations of bichloro-iodide of mercury are known; one described by M. Boullay is yellow, and contains 37.63 parts of chloride and 62.37 of iodide, which contain the same quantity of mercury; the other, obtained by Professor Liebig, consists of small blue dendritic crystals, in which the iodide is in combination with twice the amount of chloride contained in the yellow precipitate.—*Journ. de Chirurgie.*

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## ANALYTICAL CHEMISTRY.

### *Analysis of the Compounds of Sulphur with Oxygen.*

*By* MM. FORDOS and GELIS.

THE analysis of mixtures of the oxygenized compounds of sulphur is accompanied with great difficulties in the present state of science. It is still possible to detect and to determine them quantitatively when there are two in combination, but all the processes hitherto known are entirely insufficient when a larger number of them occur in the same liquid. Recent investigations have increased the number of these compounds to six, and have thus rendered the difficulties still greater; but, at the same time, they have drawn attention to some of the properties of these bodies, which are of considerable importance in an analytical point of view.

Thus the different action which chlorine and iodine exert on these acids has admitted of our determining quantitatively five of these compounds, when contained in one solution, in the most accurate manner. Although the greater number of these differences are known to chemists, yet as they serve as the basis to the



mode of analysis which we shall describe, we think it may be useful to recapitulate them.

Chlorine and iodine have no action on sulphuric and hyposulphuric acids; while, on the contrary, they rapidly convert sulphurous into sulphuric acid. Water is decomposed, and for each equivalent of sulphuric acid that is formed, one equivalent of chlorine or of iodine is absorbed, and an equivalent of hydrochloric or hydriodic acid produced.

Chlorine and iodine have quite a different action on the other three acids of sulphur. When a current of chlorine is passed into a solution of a hyposulphite, the phenomena vary according to the state of concentration of the liquid. The reaction is very complex in a concentrated solution; besides sulphur, sulphurous and sulphuric acids, a yellow liquid is formed, which subsides and has all the characters of chloride of sulphur. In a dilute solution this latter product is not formed; but however weak it may be, sulphur is always precipitated and sulphurous acid disengaged.

Chlorine, on dissolving in a dilute solution of M. Langlois's salt, or of a bisulpho-hyposulphate\*, converts readily the whole of the sulphur into sulphuric acid; but it is requisite that the quantity of water should be very considerable, for a concentrated solution would also afford chloride of sulphur.

Iodine is without action on the sulpho-hyposulphates, but it has a very peculiar behaviour towards the hyposulphites. We have shown that an equivalent of salt absorbs exactly half an equivalent of iodine, without sulphurous acid, sulphuric acid, or a deposit of sulphur being formed, and that the result of this reaction is an iodide and a bisulpho-hyposulphate.

These facts being established, it is easy to apply them either to the analysis of mixtures, or to that of the isolated compounds.

Let us take a very complicated mixture, and suppose in the same solution a sulphate, a sulphite, a hyposulphite, a hyposulphate, and a bisulpho-hyposulphate. The following will be the plan of operation:—

The liquid is divided into four equal portions.

*First portion.*—The first is employed to determine the amount of sulphuric acid. For this purpose it is mixed with a solution of chloride of barium in excess, the precipitate collected andedulcorated on the filter†, at first with boiling water, then with water rendered slightly acid with hydrochloric acid; it has now only to be dried and weighed.

*Second portion.*—The second is treated with iodine, but previously it is requisite to mix with it some grammes of carbonate of magnesia, otherwise the analysis would be impossible. In fact the

\* For a description of two of the new acids of sulphur, see p. 260 of this Journal.—ED.

† If the solution were rendered acid previous to its being treated with chloride of barium, a too large amount of sulphate of barytes would be obtained; the excess in weight might even amount to several centigrammes. It probably arises from the partial oxidation of the sulphurous acid at the moment of its separation from its combinations.



solution contains a sulphite; by depriving the water of oxygen it becomes a sulphate, but at the same time hydriodic acid would be formed. If this acid does not find, at the moment of its production, a base to saturate it, it would act on the undecomposed portion of the sulphite, or on the hyposulphite, which the liquid likewise contains, and there would result a loss of sulphurous acid and a deposit of sulphur. The carbonate of magnesia obviates all these inconveniences; it does not absorb iodine of itself, and the acids decompose it more readily than the sulphites.

The solution to which this salt has been added is now treated by iodine. When it is saturated, the weight of the iodine employed will be carefully noted down, and the amount of sulphuric acid contained in the liquid again determined by chloride of barium. The weight of the sulphate of barytes will be greater than in the first experiment; the increase in weight will indicate the quantity of sulphurous acid, and the weight of iodine which it was necessary to employ in order to convert it into sulphuric acid.

When we have arrived at this point, it will be easy, without having recourse to any further experiment, and by a simple subtraction, to procure all the elements necessary for the determination of the amount of hyposulphurous acid. The quantity of iodine which had been required to convert the sulphurous acid into sulphuric is subtracted from the total amount employed; the difference will have been absorbed by the hyposulphurous acid; or it is known that 2 equivalents of this acid absorb 1 of iodine.

In treating the liquid with iodine, an alcoholic solution of known strength is employed, as in the sulphohydrometer; or small fragments of iodine are added by degrees to the liquid from a flask, the weight of which has been previously determined. The solution is very rapid, and the point of saturation is easily ascertained. As soon as the liquid acquires a yellow colour no more should be added. The change of colour is very striking, and it is quite useless to add starch, or any other foreign body, to the solution.

*Third portion.*—This portion of the liquid is employed to determine the amount of bisulpho-hyposulphuric acid. It is saturated with iodine, with the same precautions as for the preceding, without however its being necessary to keep account of the weight of the reagent employed. The iodine will form, as we have stated above, a sulphate at the expense of the sulphite, and a bisulpho-hyposulphate at the expense of the hyposulphite. This quantity will go to increase that already contained in the solution. This being done, about 100 parts of water are added to the liquid under examination, through which a current of chlorine is then passed. The gas will bring to the state of sulphate the whole of the sulphur of the bisulpho-hyposulphate, without attacking that of the ordinary hyposulphite. When the saturation is complete, chloride of barium is added to the solution; the weight of the sulphate of barytes which is obtained will represent the sulphur of the sulphate, of the sulphite, of the hyposulphite, and of the bisulpho-hyposulphate. As the operations made with the first and second portions of the liquid will



have indicated the quantity of sulphur contained in the three first, the difference between the two weights will serve to determine the amount of sulphur contained in the latter, and consequently its entire amount.

It is useless to state in this place that the sulphate of barytes obtained in the preceding experiments should beedulcorated with boiling distilled water, and continued for some time, as it is mixed with a considerable amount of iodate of barytes, resulting from the action of the chlorine on the iodides contained in the liquid, and this iodate is very slightly soluble in water. If theedulcoration has not been sufficient, there will be a disengagement of violet vapours during calcination, indicating the presence of the iodate; and the residue will contain some free barytes, which however may easily be removed by weak hydrochloric acid.

*Fourth portion.*—There will now only remain the hyposulphuric acid. It will be readily conceived that, in order to determine the quantity of this latter acid, it suffices to know the total amount of sulphur; for then, after having assigned to the four other acids the amount pertaining to them, the difference will belong to the hyposulphuric acid.

But the determination of the whole of the sulphur is connected with some difficulties. The bringing of the lower compounds of sulphur to the state of sulphates is easily effected when acting on well-dried products; but, on the contrary, it is almost impossible not to lose some sulphur when treating solutions. Nitric acid, even the most concentrated, and *aqua regia*, always allow of some sulphurous acid escaping. Chlorine is recommended in such case, but this reagent is not more certain when operating on a solution of the hyposulphite. From the very commencement of the experiment some sulphur is precipitated, and in such a fine state of division that it is frequently quite impossible to collect it on the filter, and it is incapable of resolution. We have likewise seen that it will not convert the hyposulphuric acid into sulphate at the ordinary temperature.

When solutions are to be analysed which cannot be evaporated to dryness without being decomposed, and some of the gaseous sulphurous products being lost, a small quantity of caustic soda is added to the liquids; this soda retains the sulphurous gases, and admits of the solution being evaporated. The solid residue serves to determine the total amount of sulphur; it has only to be treated in the usual manner with fuming nitric acid.

We have supposed an extremely complex mixture; fortunately a case of this kind is seldom met with. The mode of operation will naturally have to be modified according to the nature of the solution to be examined.

If the liquid contains M. Langlois's acid, instead of a bisulphohyposulphate, no change in the mode of separation is necessary.—*Journ. de Pharm.*, June 1843.



## PHARMACOLOGY.

*On the Adulteration of Jalap-Resin.* By M. GOBLEY.

COMMERCIAL jalap-resin is very rarely obtained pure; it may even be said that it never is. Most usually guaiacum is the substance which is found mixed with it. Two methods have been described for discovering this fraud; one by means of æther, the other by nitrous acid gas.

*Employment of Nitrous Acid Gas.*—This process consists in dissolving a small quantity of the suspected resin in alcohol of 0·839, soaking a sheet of white paper in this liquid, and exposing this paper to the action of nitrous acid vapours\*. If the alcoholic solution of the jalap-resin contains any guaiacum, the paper will assume a blue colour; in the contrary case there will be no change of colour. But is it possible by this means to detect very small quantities of guaiac-resin in the jalap-resin? To ascertain this I made two solutions; the first was prepared with 10 grms. of jalap-resin obtained by M. Planche's process, and 40 grms. of alcohol of 0·839 sp. gr.; the second was made with 1 gm. guaiac-resin and 99 grms. alcohol of 0·839 sp. gr. This last solution contained therefore 1 centigramme of guaiac-resin in a gramme, which centigramme was the millionth part of the jalap-resin contained in the first solution.

When the two solutions had been prepared and filtered, I added successively to the alcoholic solution of the jalap-resin 1 gm. of the solution of the guaiacum. On each addition I immersed some white paper into the mixture, and then exposed it to the action of the nitrous vapours. Only when the solution contained 20 in 1000 did the paper assume a perceptible bluish tint. It is important that the nitrous acid vapours to which the paper is exposed should not be considerable, for without this precaution the blue colour would disappear almost as soon as it had become manifest. These 20 to 1000 are equal to 1 in 50, or 2 in 100; it is only therefore when the jalap-resin contains in 100 parts at least 2 of guaiacum that the mixture can be detected by means of this process.

*Employment of Æther.*—Æther readily dissolves guaiac-resin, but does not dissolve jalap-resin, as Planche was the first to observe; and indeed on treating 1 gm. of pulverized jalap-resin with 15 grms. of rectified æther, and decanting after 12 hours of contact, having taken care to agitate it frequently with a glass rod, I obtained on evaporation only a small quantity of a fatty substance, and not the least trace of jalap-resin.

It is on this solubility of the guaiacum and insolubility of jalap-resin in æther that the method of detecting the presence of the one in the other is founded. But is it possible by such means to determine very minute quantities of guaiacum? To solve this question, I weighed off 10 grms. of jalap-resin and 1 centigrm. of guaiacum; the two resins were dissolved in a sufficient quantity of alcohol, and

\* The nitrous acid vapours are very simply procured; it is only requisite to pour a few drops of nitric acid on to some iron filings in a common test tube.



were then brought to a pulverulent state. The powder was conveyed into a bottle, with a ground stopper, containing rectified æther; after one hour's contact, having been well mixed up with a glass rod from time to time, I decanted the æthereal solution. On evaporation it left a small residue of a fatty substance, and the small quantity of water which existed in the æther had become opalescent from the presence of guaiacum. In fact, on adding a few drops of alcohol of 0·839 sp. gr., I obtained a perfectly transparent liquid, which floated on the fatty matter. Some paper immersed in this liquid, and exposed to the action of a *weak* disengagement of nitrous acid vapours, acquired a bluish tint.

According to these experiments, therefore, æther is the best agent to determine the purity of jalap-resin, as it allows of the smallest traces of guaiacum being isolated. Jalap-resin, which cedes to æther a portion of its resinous substance, should be rejected. Colophony, which is also sometimes mixed with commercial jalap-resin, is similarly circumstanced.

Although by this latter means it is possible to be convinced of the purity of the jalap-resin, yet I think that this substance is one of the energetic medicines which the pharmacist should always prepare himself.—*Journ. de Chim. Méd.*

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## CHEMICAL PREPARATIONS.

### *On the Preparation of Iodic Acid.* By M. HERBERGER.

As iodic acid has recently come into extensive medicinal use, the author was induced to examine the various methods of preparation in a purely practical point of view. It was found, as was already observed by Duflos, that of all the existing methods that of Prof. Liebig is the most practical, and at the same time the most advantageous. The following are the principal results to which the author came with respect to the various methods.

*a. Method of the Discoverer, H. Davy.*—Pulverized iodine is conveyed into a flask containing perfectly dry, so-called oxychloric gas. [For 4 parts of iodine, the quantity of gas liberated from 10 parts chlorate of potash by means of 40 parts hydrochloric acid of 1·105 spec. grav.] The action is somewhat lively at the commencement, but subsequently progresses very slowly, and on the application of heat a heavy liquid or semi-solid yellow mass is formed, which consists of a mixture of chloride of iodine and iodic acid, from which the former may be driven off by evaporation at a gentle heat, and the latter then remains in the residue as a whitish mass, which may be obtained in perfectly white tabular crystals by recrystallization. 3 oz. of iodine afford 1 oz. 2 grs. of *pure* iodic acid. The disengaged impure chloride of iodine may however be collected and further used for iodic acid. The employment of iodine precipitated in the moist way and carefully dried facilitates the action.

*b.* When vapour of iodine and oxychloric gas, both dry, are passed



from opposite sides into a bell-glass, reciprocal action takes place with considerable evolution of heat; a large quantity of iodine however escapes oxidation and combination, for it is very difficult to keep up such a temperature that no portion of the iodine is precipitated in a crystalline state on the sides of the vessel.

A further objection to both these processes is, moreover, the circumstance that great inconvenience is experienced from the mixed vapours of the chloride of iodine and of oxychloric gas, besides being exposed to the dangers of explosions.

c. A. Connell described in 1830 a method of converting iodine into iodic acid by means of highly concentrated nitric acid. Duflos asserts that the nitric acid should be highly concentrated and free from nitrous acid, as this has a reducing action on the iodic acid.

Duflos obtained *more* iodic acid than can be accounted for by calculation, supposing the product to be anhydrous iodic acid; but when prepared in this manner it contains water. The amount of water of the crystallized acid is still undetermined. In this method of preparation a very considerable amount of iodine is lost, on an average about one-fifth or one-fourth of the entire quantity. According to a subsequent statement of Mr. Connell's, this loss may be avoided by taking a vessel, in the preparation of the iodic acid, of from 40 to 50 times the capacity of the nitric acid employed, so that the volatilized iodine may be condensed on the large surface exposed, and may again be washed back into the acid. He also recommends boiling over the small flame of a spirit-lamp, that the sides of the vessel may be kept as cold as possible. M. Pouleng has quite recently (*Journ. de Pharm.*, 1842, p. 508) again taken up this method. The following are the essential points of his communication:—He first prepares, by distillation of *fused* nitre and hydrate of sulphuric acid, boiled for several hours to remove as much water as possible, in equal parts, the most concentrated nitric acid, taking care to keep the recipient constantly cold, in order that the vapours of nitrous acid produced, together with the nitric acid, may be almost entirely fixed. From 3500 grms. of nitre and the same quantity of hydrate of sulphuric acid, he obtained 2000 grms. of strongly fuming concentrated nitric acid, containing a large quantity of nitrous acid, with which he was able in a few hours to convert 250 grms. iodine into 375 grms. iodic acid. For this purpose he conveyed 25 grms. iodine and 80 grms. of the above-mentioned nitric acid into a flask with a long neck; heated it gently over a charcoal fire, or still better in a water-bath; and after the reaction, which is at first very violent, had subsided, poured the nitric acid, which had become ineffective from its hydrated state, from off the portion of the iodine which had not been acted on, and then added a quantity of concentrated nitric acid equal to that first employed. When this operation has been repeated sufficiently often, the residue (iodic acid) is freed by warming in a porcelain dish from excess of iodine, and is dissolved in distilled water, with the addition of a small quantity of a *somewhat* more dilute nitric acid (according to Boutin), or the syrupy solution is allowed to evaporate by exposure to the air (ac-



according to Serullas), and is thus brought to crystallization. The first process is quickest, but the latter affords more beautiful crystals. If the crude iodic acid, which is now and then stirred with the nitric acid added, is allowed to dry at a gentle heat, a sandy, crystalline, beautifully white product is obtained.

The so-called crude iodic acid has generally a reddish appearance, from interposed particles of iodine; the subsequent mixing it with nitric acid accomplishes its entire oxidation; the exposure of the aqueous solution of iodic acid to the atmosphere favours the volatilization of the particles of iodine. It is however never possible to obtain the iodic acid in *distinct* crystals by *quicken*ed evaporation.

Supposing crystallized iodic acid to contain 1 atom of water, then 250 grms. iodine should afford 345 grms. of crystallized iodic acid; Pouleng however states that he obtained 375 grms. Herberger, on an exact repetition of his prescription, obtained from 3 oz. of pure iodine, 3 oz. 372 grs. of perfectly white, beautifully crystallized iodic acid; there should have resulted, according to calculation, with the above amount of water, 4 oz. 69 grs. The successive treatment of the iodine with nitric acid limits therefore in some degree the unavoidable loss of iodine in this process. Among the disadvantages of this method there is moreover this circumstance, that all the iodic acid obtained by the oxidation of iodine by means of nitric acid constantly retains some of the latter intermixed. The method is moreover expensive, as comparatively a large quantity of pure concentrated nitric acid, which is by no means cheap, is requisite, and there is always a considerable loss of iodine. The acid dried under constant stirring, without any subsequent addition of nitric acid, then dissolved in water and recrystallized, proved to be the purest.

d. The method proposed by Serullas, founded on the decomposition of the chloride of iodine by water into iodic acid and hydrochloric acid, is very simply performed by shaking chloride of iodine, saturated as much as possible with chlorine, with a *small* quantity of water, or, with greater advantage, a solution of chloride of iodine with fragments of glass. By these means the pulverization of the chloride of iodine is effected, its conversion into iodic acid, and its separation from any adherent protochloride of iodine. The powder is then freed as much as possible from the liquid, and successively treated in a dish with small portions of alcohol and æther. The solid portion soon becomes white, the supernatant liquor is coloured yellow; the operation is continued until the alcohol or æther remains colourless. The iodic acid is now left as a white sediment of a sandy, crystalline appearance. The preparation of the chloride of iodine, which moreover is constantly obtained mixed with a large amount of protochloride, is accompanied with many inconveniences. The expense of alcohol and æther, and the extremely small produce (M. Herberger obtained in two experiments only one-seventh, and one-sixth iodic acid in proportion to the quantity of iodine employed), have justly caused this method to be discarded.

e. Iodate of soda, which may be obtained by decomposing with carbonate of soda, chloride of iodine, or better, according to Liebig,



an aqueous mixture of hydrochloric acid, iodic acid and iodine prepared by treating iodine with water and chlorine gas, is dissolved in water and decomposed hot by excess of fluosilicic acid. Boiling is continued until no smell of the latter acid is apparent; the syrupy liquid which is at last obtained is very difficult to filter, from its containing some fluo-silicate of soda; it is evaporated at a gentle heat, and the residue purified by recrystallization (Serullas). This process affords a good produce, but according to Liebig, Duflos and Herberger's experience, it is very tedious and takes up too much time; nor could they succeed in removing all traces of fluo-silicate of soda.

*f.* Iodate of soda is dissolved in water, and treated with at least double the quantity of concentrated sulphuric acid requisite to saturate the soda; the whole is boiled from 12 to 15 minutes; the sufficiently concentrated liquid is filtered, and left to crystallize in a drying furnace at  $68^{\circ}$  to  $77^{\circ}$  Fahr., which soon takes place. The crystalline mass obtained is washed with a little water, dried and pressed, when it divides into minute brilliant crystals. The sulphuric acid, sulphate of soda, and a little iodic acid, which cannot be entirely removed, remains in the mother-ley. According to Serullas, the iodic acid is obtained, without further trouble, perfectly pure. To obtain it, or the product prepared according to *e*, in well-formed crystals, a little hydrofluoric acid is added to the aqueous solution, or a very dilute solution is formed, which is then treated with some sulphuric, or, better, nitric acid, and the whole left to spontaneous evaporation; or, if preferred, place the aqueous solution of iodic acid, evaporated to the consistence of a syrup, aside in a dry place, when the iodic acid gradually separates in the form of hexagonal plates. Liebig found that the employment of sulphuric acid occasions a very considerable loss of iodine. On dissolving, with the application of heat, 1 part of iodate of soda in 1 part of sulphuric acid which had been diluted with its weight of water, and leaving the solution to evaporate *on the sand-bath*, he obtained crystals which, exposed to the atmosphere in a small porcelain dish, changed after some time into a white non-crystalline mass. He is inclined to admit that the process in question afforded crystals of *anhydrous* iodic acid, which absorbed, by exposure to the air, a sufficient quantity of water of crystallization, and then again became solid. Herberger could not observe this appearance when he allowed the solution of iodic acid to evaporate spontaneously; nor could he succeed by repeated recrystallization in obtaining the iodic acid entirely free from all traces of foreign acid (hydrofluoric acid, sulphuric acid, &c.). 3 oz. of iodine afforded, according to the method described under *e*, 3 oz. 75 grs. of hydrated white iodic acid; according to *f*, only 2 oz. 64 grs. to 2 oz. 102 grs.

*g.* Of all the methods hitherto proposed, the most profitable, and comparatively the cheapest mode of preparation, is that of Prof. Liebig, in which the iodic acid is separated by sulphuric acid from iodate of barytes. To prepare this salt, chloride of barium is added to the solution of iodate of soda and chloride of sodium, which should have



been recently treated with chlorine, as long as any iodine separates on the addition of carbonate of soda, until no more precipitate is formed; the white precipitate is collected on a filter and well edulcorated with water and dried. 9 parts of dry iodate of barytes are now boiled with 2 parts of sulphuric acid, previously diluted with from 10 to 12 times the weight of water, for half an hour; the sulphate of barytes formed is separated by filtration; the free iodic acid in the solution evaporated to a syrupy consistence, and left in this state for several days exposed to the air, when perfectly transparent, regular crystals of hydrated iodic acid, which gradually increase in size, are soon formed\*. The decanted mother-ley affords, treated in the same manner, beautiful crystals to the last drop. If however the solution of iodic acid had been concentrated too much at first, before being left to spontaneous evaporation, it generally solidifies to a white mass, which must be redissolved in water and treated as above described to obtain well-formed crystals. 3 oz. of iodine afforded, by strictly following this process, which is by no means troublesome, 4 oz. 19 grs. of crystallized iodic acid.

*h.* Bohlig recommends conveying iodine in small excess into warm solution of caustic potash of 1.33 spec. grav., separating the liquid containing iodide of potassium (which is collected separately, and further employed) from the more insoluble iodate of potash which subsides, washing the latter on the filter with weak alcohol, drying it, dissolving it in boiling water, and then decomposing it with chloride of barium as long as any precipitate is formed. The iodate of barytes thus obtained is decomposed with sulphuric acid, and the iodic acid purified by crystallization, &c.

The solubility of iodate of potash in water, and also in solution of iodide of potassium, is however by no means small, and accordingly the amount of iodate of potash is diminished; and moreover the preparation of *pure* iodide of potassium, according to this method, is accompanied with difficulties from the imperfect decomposition of the iodate of potash at a red heat. The separation of the iodate of potash from iodide of potassium can only be effected accurately with strong alcohol, of which a considerable quantity is requisite; and moreover a certain amount of iodide of potassium is lost, if the iodate of potash is not separated entirely from it. The method certainly affords pure iodic acid, whether the iodate of potash form the chief or merely the collateral product; but for the above-mentioned reasons it is not equal to Liebig's method.

*i.* Experiments in which the alkaline chlorites were employed, oxidation by means of chromic acid, &c., showed that iodic acid might be *produced* by such means, but the application of these processes was not found to be advantageous.—*Jahrbuch für Prakt. Pharm.*, vi. p. 96.

\* According to Davy's view no educt could be obtained by decomposition of an iodate by means of sulphuric acid, &c., which was free from sulphuric-iodic acid (double acid). Herberger however could not observe, on adhering strictly to the above prescription, that the separated acid was possessed of any other properties than those belonging to the purest iodic acid. Nor is there any formation of hyperiodic acid.



*Protiodide of Iron.*

The most advantageous, and to the patient the most agreeable form of administering the protiodide of iron is, according to C. Hoffmann, in the form of the *fresh* prepared aqueous solution. 8 grs. of iodine are triturated with 2 grs. of iron-filings and a little distilled water, which afford 10 grs. of protiodide of iron, which is filtered and diluted with distilled water as may be required.—*Jahrbuch für Prakt. Pharm.*, vi. p. 32.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*Observations on Terra di Siena and on Umber.* By A. MAUS.

THE mineral colour which is known in commerce under the name of *Terra di Siena* occurs in roundish fragments, sometimes of the size of a walnut; its cleavage is conchoidal, and in general it has a brownish colour. At times however some pieces are found among it which are perfectly yellow. The specific gravity of the dark brown kind is 2.1; the light brown and yellow pieces are lighter. The *Terra di Siena* is also employed in the burnt state, when it has a reddish-brown colour. In exposing some balls, which I had formed with water, to a free charcoal fire, the balls, on becoming red-hot, gave off fumes of arsenic, which rather surprised me, as the *Terra di Siena* is placed among the non-injurious colours. I was therefore induced to examine this substance more closely.

On testing it I found sesquioxide of iron, oxide of manganese, arsenic acid, silica, a trace of alumina, and in one kind a slight trace of cobalt.

The following are the results of a quantitative analysis:—100 parts of pulverized dark brown *Terra di Siena*, dried at 212° Fahr., gave—

	Dark brown kind.	Yellow kind.
Sesquioxide of iron . . . . .	66.0	28.8
Oxide of manganese . . . . .	3.4	1.1
Arsenic acid . . . . .	8.7	0.5
Silica . . . . .	8.0	63.0
Water . . . . .	13.3	4.6
Loss . . . . .	0.6	2.0
	100.0	100.0

The close affinity of umber to *Terra di Siena* induced me to make a comparative examination. For this purpose I chose the common umber, and found it to contain the following ingredients:—sesquioxide of iron, oxide of manganese, silica, water, some carbonate and sulphate of lime, a trace of arsenic, and moreover a considerable quantity of sand, which was removed as much as possible by suspension in water. The traces of carbonate and of sulphate of lime should probably be ascribed to the water employed in form-



ing the umber into balls, and were not regarded as belonging to the compound. A quantitative analysis afforded the following result:—

Sesquioxide of iron .....	46·2
Oxide of manganese .....	9·8
Silica .....	33·1
Water .....	10·5
Loss .....	0·4
	<hr/> 100·0

As on treating the umber with hydrochloric acid the silica does not separate in a gelatinous state, but as a powder, of which moreover but a very small portion was soluble in boiling solution of caustic soda, we are justified in regarding this silica as resulting from intermixed particles of sand. UMBER therefore is a mangani-ferous hydrate of the sesquioxide of iron.

While therefore the *Terra di Siena* contains a somewhat considerable amount of arsenic, so that the Prussian Police Council have resolved, on my advice, to exclude it from the list of innocuous colours, no danger need be apprehended from the minute traces of this poisonous element contained in the umber, the more so as in it the arsenic is in combination with sesquioxide of iron.—*Archiv der Pharm.* for May.

### *Testing of Manganese Ore as to its Amount of Peroxide.*

*By* Dr. H. BAUMANN.

In a late Number of the Chem. Gazette\* a description was given of M. A. Levöl's method of testing manganese ore. The following is recommended as more simple and certain; it is founded on the fact that 2 atoms of absolute hydrochloric acid, when mixed with 1 atom of peroxide of manganese, liberate 1 equivalent of chlorine, with formation of 1 atom of water and 1 atom of protochloride of manganese.

1 grm. of the manganese ore to be tested is conveyed into a small flask, and 9·933 grms. of hydrochloric acid of 1·110–1·120 spec. grav. poured over it, and a glass tube twice bent at right angles connected to the flask by means of a cork, while the other extremity of the glass tube is inserted into a flask containing a solution of 6·1384 grms. of fused nitrate of silver in distilled water. The air is first expelled from the flask by gently heating on a sand-bath, and the two flasks then connected: the one containing the manganese is then heated over a spirit-lamp until all the chlorine is expelled and the contents reduced to dryness.

The whole of the liberated chlorine is absorbed by the solution of silver, and is precipitated as chloride of silver; not a trace of chlorine can be detected by the smell. When the disengagement of chlorine has ceased, which is seen from the liquid ascending the glass tube, the apparatus is immediately disconnected and a little air blown through the tube, to combine any chlorine contained in it.



with the solution of silver. The tube is then washed through with a little water, and the flask closed with a cork after the addition of a little pure nitric acid. It is shaken once or twice, the precipitate allowed to subside, and then collected on a weighed filter.

The well-edulcorated air-dried precipitate may easily be removed for the greater part from the filter; the chloride of silver is heated to fusion in a counterpoised porcelain crucible and its weight determined. The filter, with the adherent chloride of silver, is dried at  $212^{\circ}$  Fahr., and its increase in weight added to that of the chloride of silver, which should amount to 3.9205 grms. if the manganese ore consisted of pure peroxide ( $\text{MnO}_2$ ).

In an experiment made with crystallized pyrolusite from Ilmenau, the result agreed exactly with the above statement. This method may therefore be recommended for its accuracy, as well as from its being easy of execution.—*Archiv der Pharm.* for May.

*On the Colouring Properties of Aloetic Acid.* By M. BARRESWIL.

M. Barreswil has communicated to the *Journ. de Pharm.* a very interesting fact, which will not fail to attract the attention of naturalists and chemists. Aloetic acid melted with colophony gives rise to one of the most intense blue colours. The author has not yet been able to extract this colouring matter; but he observed that the resin thus rendered blue dissolved readily in alcohol, in essences, and in fatty bodies, which allows of its being employed to colour these substances blue, or for the purpose of injection. The colouring power of the aloes blue is very considerable. Some decigrammes of crude aloetic acid melted with about 20 grms. of resin suffice to colour a pound of fat.

## PATENTS.

*Patent granted to Dr. W. G. Turner, Gateshead, for Improvements in the Manufacture of Alum.*

THE nature of my invention consists in the manufacture of alum from felspar rocks, or any other rocks or mineral substances containing silica and alumina, sufficiently free from other substances to be subjected to my process, which is performed by the aid of potash or of soda, as will be presently explained. And when I use potash, I call it a potash alum; and when I use soda, I call it a soda alum. I proceed, when desirous of making a potash alum, by fusing felspar, or other rock or mineral substance containing silica and alumina, with such salts of potash as will yield a product, when fused at a red or white heat, of a uniform glassy appearance. This mass, if sufficient potash has been used, is readily decomposed by water; the quantity of the salts of potash required will in general be about twice the weight of the mineral substance used, although under certain circumstances smaller quantities may answer. The aqueous



solution contains silicate of potash, and the insoluble residuum is a light porous substance, similar in chemical composition to the mineral commonly called *elæolite*; this porous substance is decomposed by sulphuric acid, and forms alum by the separation of its silica. If the above process be performed with the salts of soda instead of potash, the porous substance obtained will be similar in chemical composition to the mineral known commonly as *nepheline*\*, and its decomposition by sulphuric acid will give rise to the formation of a soda alum. The manner in which my said invention is to be performed is as follows:—

If desirous of making a potash alum, the best substance to operate upon is a potash felspar. This felspar is ground, in a common edge-stone mill, to the consistency of fine sand (a process which is much assisted by heating it to redness, and then plunging it in cold water); it is then mixed with its own weight of sulphate of potash, and placed in the upper part of the inclined bed of a reverberatory furnace (being such a furnace as is known in the potteries as a frit furnace), and which furnace has previously been brought to a full white heat. When by the action of the heat a glass has been produced, and is observed to flow down the inclined bed of the furnace, to such glass is to be added gradually, at the lower end of the furnace, as much carbonate of potash as was before used of sulphate of potash. And this process of placing the mixture of felspar and sulphate of potash at the upper part of the bed of the furnace is to be repeated, adding at the lower part of the bed, gradually and proportionally, as the glass flows down from the upper part, the carbonate of potash, as before mentioned. This is continued until the sack of the furnace is filled with the glass; this glass is then fit for the next process. The preparation of the glass may also be effected in a reverberatory furnace with a flat bed, and the facility of removing the glass from such a furnace is an advantage. In this case no carbonate must be added to the mixture until the sulphate of potash is observed to be completely decomposed. On boiling in water the glass thus obtained, the same quantity of potash as was added to the felspar and two-thirds of the silica contained in the felspar are dissolved, while the remaining one-third of the silica and the alumina, and an equal quantity of potash as the felspar originally contained, are left in the form of a light porous substance, similar in chemical composition to the mineral commonly called *elæolite*; this porous substance is carefully separated from the said solution, and washed with water until freed from the silicate of potash, then placed in an open leaden cistern or boiler, and boiled with dilute sulphuric acid of the specific gravity 1·2 (one and two-tenths). This acid will contain about the quantity of water required for the solution and crystallization of the alum produced by the decomposition of the *elæolite*;

\* The minerals *elæolite* and *nepheline* are composed of 3 atoms of silica, 2 atoms of alumina, and 2 atoms of alkali. The alkali however always consists in both minerals of 4 equivalents of soda to one of potash. See *Phil. Mag.* vol. xvii. p. 105.—Ed.



the quantity of the dilute sulphuric must be such as will contain about 160 lbs. of dry sulphuric acid for every 285 lbs. of felspar rock (if that rock be used), and in like proportion to the silica and alumina contained in the substance, if any other substance be used, as it is important that the alum solution thus obtained should not contain an excess of acid. I recommend that only four-fifths of the proposed quantity of dilute sulphuric acid should be used in the first operation, which will leave a portion of the elæolite undecomposed; but by acting upon this undecomposed portion, after the solution has been drawn off, with the full quantity of dilute acid to be used in the next operation, it will be completely decomposed, and the alum thus formed becomes part of the next batch. In this way a neutral solution of alum is obtained at each process. The boiling solution, after the sediment subsides, is drawn into coolers, such as are commonly used for the crystallization of alum; here about four-fifths of the alum held in solution will form into crystals. The mother-liquor from the coolers is boiled in any convenient boiler to dryness, in order to render the silica it contains insoluble; the residuum is boiled either in water or in the mother-liquor from the roachings tubs, so as to dissolve the alum it contains, and the process of crystallization repeated. Had the above process been performed with the salts of soda instead of potash, a soda alum would have been formed. For this purpose the soda felspar or albite should be selected. The potash or soda (as the case may be) contained in the liquor, drawn as aforesaid from the elæolite (or nepheline, which is formed when soda is used), may be recovered by either of the following processes:—The strong solutions which are obtained, about the specific gravity of 1.2 (one and two-tenths), are placed in any convenient vessel in which a stream of carbonic acid gas, obtained in any convenient method, may be driven through them, the carbonic acid becomes absorbed, and the solution assumes the form of a gelatinous mass; this mass consists of carbonate of potash or soda and hydrate of silica. On drying this mass in a furnace, which must never be allowed to rise to red heat even in the dark, the silica loses its water and becomes insoluble; the potash or soda may then be separated from it in the form of a sesquicarbonate of potash or soda, by solution and evaporation to dryness. The other process, which under most circumstances will be found more economical and convenient, is to allow the boiling solution of silicate of potash or soda to filter through a bed of caustic lime, when it will be found that the lime has combined with the silicate, and a caustic potash or soda ley is obtained. This process may be conveniently conducted in an apparatus similar to that used by soap-makers for the preparation of their caustic leys. The potash or soda may then be readily obtained as caustic potash or soda, or as carbonate, by the known processes used in making soda. The weak solutions of silicate of potash or soda are used to decompose another portion of the glassy substance.

Now I do not claim as new, or as my invention, any particular



form of vessel or apparatus in which or with which my operations may be conducted; nor do I claim any particular proportions in which the alkaline salts may be used. But I claim as new, and as my invention, the improvements aforesaid, and the production of substances similar to elæolite and nepheline artificially, by the decomposition by water of the glassy substances produced by the fusing of felspar, as aforesaid, or other mineral substances containing silica and alumina, with salts of potash and soda, as aforesaid, and the use and application of such artificial elæolite and nepheline in the production and manufacture of alum as aforesaid. I also claim the process, as above described, for separating the alkalies from silica by means of caustic lime.—Sealed Oct. 8, 1842.

*Patent granted to John Mullins, Battersea, for certain Improvements in making Oxides of Metals, in separating Silver and other Metals from their Compounds with other Metals, and in making White Lead, Sugar of Lead, and other Salts of Lead, and Salts of other Metals.*

The patentee claims—1st, the manufacturing of oxides of lead and of other metals, by passing currents of atmospheric air or oxygen gas, or other suitable aeriform matter, below the surface of or through the metal when in a melted state, at the temperature of their respective points of oxidation, whereby, in the case of lead, silver is accumulated and rendered more easy of separation; 2nd, the acting on oxide of lead so formed by the vapour of vinegar and carbonic acid gas, for the purpose of manufacturing what is commonly called white lead; 3rd, in the manufacture of white lead, by exposing a solution of acetate of lead or other suitable salt of lead made from oxide of lead, to an atmosphere of carbonic acid gas; 4th, the application of common soot to deoxidize the oxide of lead, and generally in the reduction of metals from their ores or oxides; 5th, the application of magnets to separate iron from the oxide of lead or of other metals.—Sealed Oct. 27, 1842.

*Patent granted to Edmund Tuck, Haymarket, for certain Improvements in the Covering or Plating with Silver various Metals and Metallic Alloys.*

This invention consists in the use of either of the two carbonates of ammonia (namely, the sesquicarbonate and the bicarbonate) as one of the ingredients in the mixtures or compounds employed for covering or plating various metals and metallic alloys with silver, by the action of electricity.

The material of which the articles usually plated with silver are composed is either copper or its alloys, and of those alloys that commonly called German silver is most frequently used. The plating or covering is effected by the aid of a solution, composed (according to the present invention) of the sesquicarbonate or bicarbonate of



ammonia and a salt of silver ; but the patentee finds it advantageous to vary the salt of silver according to the nature of the metal or alloy to be plated ; thus for the common kinds of German silver, a mixture of a solution of bicarbonate of ammonia with sulphate of silver ; and for plating on copper or good German silver, a mixture of a solution of bicarbonate of ammonia with cyanide of silver is preferred to be used.

The plating mixture is prepared by dissolving 1 equivalent (70 parts by weight) of bicarbonate of ammonia in distilled water ; then adding thereto 1 equivalent (156 parts by weight) of sulphate of silver, or 1 equivalent (134 parts by weight) of cyanide of silver, and boiling the liquor until the salt of silver is entirely dissolved. The strength of the solution, that is, the proportion of water, must be regulated by the strength of the galvanic battery employed. The strongest solution which the patentee has had occasion to use, when coating bad German silver, was composed of half an ounce of sulphate of silver and 107 grs. of bicarbonate of ammonia dissolved in 1 pint of water. The battery which the patentee prefers is a modification of "Daniell's constant battery."

The article to be plated is cleaned before submitting it to the action of the battery, by immersing it for two or three hours in a cold solution of carbonate of potash in water, then washing it in cold water, and afterwards dipping it into a mixture of aquafortis and water ; the proper strength of which depends on the nature of the metal or alloy used in the manufacture of the article. After this it is washed and dried, and then well-rubbed with rotten-stone on a rag or piece of leather ; and immediately before it is immersed in the plating liquid it must be dipped into a solution of common salt in which a little gum has been dissolved. The quality of the alloy of German silver may be known by its appearance when taken out of the pickle, or mixture of aquafortis and water ; the best kinds having a perfectly white surface, and the inferior kinds being more or less darkly coloured.

The patentee claims the use of either of the two carbonates of ammonia, namely, the sesquicarbonate and the bicarbonate, as one of the ingredients in the mixtures or compounds employed for covering or plating with silver various metals and metallic alloys by the action of electricity.—Sealed June 4, 1842.



# THE CHEMICAL GAZETTE.

No. XIX.—August 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On a Fatty Substance in Beer.* By Dr. VOGEL, Jun. of Munich.

ACCORDING to the admirable investigations of Prof. Liebig, the fat in the animal body derives its origin from the non-nitrogenous articles of food, which undergo such a metamorphosis in their digestion that the carbon of these substances remains in the body as fat. In opposition to this view the French chemists, MM. Dumas and Bous-singault\*, assert that animals, of whatever kind they be, produce no fat, but obtain it direct from the vegetable kingdom; consequently, that only in those animals which take fat in their food do we find fat to be deposited in the cellular tissue†.

Prof. Liebig‡ showed to the contrary by the quantitative determination of the fat in several vegetable articles of food, for instance in peas, beans, rice, maize, &c., that the small amount of fat contained in these substances was in no proportion to that of the animals which had been fed on them.

Among the substances which, according to general experience, have a very decided influence on the formation of fat, is beer. As no observations have hitherto been published on the amount of fat contained in this beverage, I have made some experiments on the subject.

Beer affords, as is well known, on slow evaporation, a brown viscid residue. This was dried in the water-bath at 212° Fahr. and reduced to a fine powder. Treated several times with boiling æther, this brown substance gave a yellow oily fat, having a peculiar odour resembling that of malt. This fat forms soluble soaps with the alkalis, and leaves a fat stain on blotting-paper.

With respect to the quantity of fat in the beer, it was found in three experiments, which agreed well with each other, that 100 parts of the extract contained 0.1605 substances soluble in æther.

Since 1 quart of Munich winter beer leaves on an average when evaporated 18 drachms of extract, we find that 1.728 gr. of a fatty substance is conveyed into the frame in 1 quart of beer.

\* Ann. de Chimie et de Physique, vol. iv., p. 208.

† Such were their published opinions, but these views appear to change with each succeeding Number of the 'Comptes Rendus.'—Ed. Chem. Gaz.

‡ Ann. der Chem. und Pharm., Jan. 1843; also Philosophical Magazine for July 1843.



Supposing a man to drink daily 2 quarts of beer, then according to this calculation there would in the course of a year be an increase of  $2\frac{1}{2}$  oz. of fat, an increase in weight which by no means agrees with the frequent corpulence of beer-drinkers.

Since beer contains so small an amount of constituents soluble in æther, and as an article of food has, according to the experience of physicians, an undoubted influence on the formation of fat, the effect must necessarily be ascribed to the decomposition of the other constituents of the beer, thus affording a further confirmation of the theory of the formation of fat advanced by Prof. Liebig.—*Ann. der Chem. und Pharm.* for May.

*On the Crystalline Substance from Athamanta Oreoselinum.*

Our readers are aware that M. Winckler recently discovered a new crystalline substance in *Athamanta Oreoselinum*\*. We now learn from Prof. Wöhler, that MM. Winckler and Schnedermann are at present engaged in an examination of this highly remarkable body. It is decomposed by alkalies and acids quite simply into valerianic acid and into a fusible waxy substance. The body in the *Athamanta* appears therefore to have a composition analogous to that of fats, and the waxy substance to occupy the place of the glycerine.

*On the Artificial Formation of Butyric Acid.* By MM. PELOUZE and GELIS.

[Continued from p. 482.]

The phænomena which result from the action of butyric acid on alcohol, pyroligneous spirit, and on glycerine, are very curious.

*Butyric Æther.*—The ætherification of alcohol by butyric acid is effected very slowly and with great difficulty; but when a certain quantity of sulphuric acid is added to the mixture of the two substances, the formation of the butyric æther is, it may be said, instantaneous. If, for instance, 100 grms. of butyric acid are placed in contact with 100 grms. alcohol and 50 grms. concentrated sulphuric acid, the mixture becomes heated, and separates immediately into two liquids of different density. The lighter is butyric æther, the weight of which is nearly equal to that of the butyric acid employed. But a still more curious fact is, that the presence of even a very considerable quantity of water presents no obstacle to the ætherification: thus, in the example just mentioned, the proportion of water may be raised to far beyond the amount of sulphuric acid, without the truly extraordinary aptitude of this acid to ætherify alcohol being apparently diminished. There is not a single other case of so quick and easy a formation of a compound æther that can be cited.

The importance of the preceding facts in the discussion of the phænomena of the formation of æther will be readily conceived, and

\* See Chem. Gaz., p. 113.



the support which they afford to the ingenious views of M. Mitscherlich on one of the most delicate theories of organic chemistry.

Butyric æther obtained in the above manner only requires to be washed with some water, dried over chloride of calcium and distilled, to be obtained pure. It is liquid, colourless, very fluid and inflammable, of an agreeable odour, which has some resemblance to pineapple. It is very little soluble in water, soluble in every proportion in alcohol and in pyroligneous spirit. It boils at  $220^{\circ}$  Fahr. The density of its vapour was found to be 4.04; 4 volumes of this vapour represent 1 molecule of æther. The alkalies, even boiling, decompose it very slowly; it then affords the ordinary products of decomposition of compound æthers. Butyric æther is represented by the formula  $C^8 H^7 O^3 + C^4 H^5 O$ .

*Butyrate of Methyle.*—The butyrate of the oxide of methyle is prepared with the same facility as the æther, and is purified by a similar process. The mixture of butyric acid with pyroligneous spirit and sulphuric acid gives rise immediately to the formation and separation of a considerable quantity of the butyrate of the oxide of methyle.

The butyric æther of pyroligneous spirit is composed according to the formula  $C^8 H^7 O^3 + C^2 H^3 O$ ; it is liquid, colourless, inflammable, of a peculiar odour, which has some analogy to that of methylic alcohol. It is scarcely soluble in water, soluble in every proportion in alcohol and pyroligneous spirit; it boils at about  $215^{\circ}$  Fahr.; the density of its vapour is 3.52, 4 volumes of which represent 1 molecule æther.

The extraordinary facility with which butyric acid converts alcohol and pyroligneous spirit into æthers, under the influence of sulphuric and hydrochloric acids, induced us to attempt to form some combinations of the same class with substances which it is now generally agreed to consider as belonging to the series of alcohol. Such are in particular the essential oil of potatoes, æthal and glycerine. The investigation of the products of these reactions will form the subject of a subsequent memoir. We will at present merely offer a few observations on the action of butyric acid on glycerine.

When a mixture of these two substances and of concentrated sulphuric acid is gently heated, and is subsequently diluted with a considerable quantity of water, a slightly yellowish oil separates from the liquid, which may be washed with large quantities of water, as it is not at all or very little soluble in this liquid.

This fatty matter is soluble in every proportion in concentrated alcohol and in æther, from which it may readily be separated by the addition of water. Saponified with caustic potash, it affords butyric acid and glycerine. Its formation takes place at the ordinary temperature if a current of hydrochloric acid gas be passed into a mixture of glycerine and butyric acid. Water immediately separates from this mixture a considerable quantity of the new fatty matter.

The formation of this substance, its conversion by the hydrated alkalies into butyric acid and glycerine, and some other circum-



stances, induce us to consider it as the same fatty matter which Chevreul discovered in butter, and to which he applied the name of *Butyrine*. We however express this opinion with much reserve, for on the one hand butyrine has never yet been obtained in a state of purity—its elementary composition is unknown; and on the other, if glycerine is well known in its hydrated state, or in the sulphoglycerate of lime, the numbers expressing the quantity of water which it loses on entering into combination with acids to form the neutral fatty bodies, are probably not yet well established, which must be especially attributed to the high atomic weight of these substances.

A comparative investigation of the butyrine extracted from butter with the substance under consideration, will alone allow of our solving the interesting question of the identity or dissimilarity of the two substances.—*Comptes Rendus*, June 12, 1843.

*On a Peculiar Formation of Ferric Acid.* By M. WALZ.

When caustic potash is employed in the preparation of iodide of potassium, and the operation is effected in iron vessels, a reddish-brown mass is obtained on evaporation after the ley has been slightly supersaturated with iodine. If this mass is now heated, in order to decompose the iodate of potash, in iron vessels, as long as any oxygen escapes, and then dissolved after cooling in water, a beautiful violet solution is frequently obtained, which has an alkaline reaction, and on saturating it with strong or weak acid after filtration, it is decomposed with evolution of oxygen. The solution likewise becomes gradually decolorized by long exposure to the atmosphere, with a deposition of peroxide of iron. This phenomenon only occurred when an excess of iodine had been dissolved in the solution of potash, to which however an excess of potash was subsequently added. Iodide of iron is produced, which is subsequently decomposed on the addition of the solution of potash, by which means the protoxide of iron is diffused through the mass in a very finely-divided state. When the dry mass which contains the protoxide of iron and free potash is heated to redness, a quantity of oxygen is given off from the iodate of potash, which combines in *statu nascenti* with the protoxide of iron.—*Jahrb. für Prakt. Pharm.*, v. p. 344.

*Examination of the Flowers of Linaria vulgaris.* By M. RIEGEL.

The author found 1000 parts to contain 748 water, 133·5 fibre, 49·5 mucus, 32 sugar with lime salt, 8 albumen, 2·25 of a tannin giving a green colour with iron, 5·5 of a fatty chlorophylle, 8 anthoxantine, and 11·5 of a peculiar colouring substance, which he proposes to call *æthokirrine*.

The flowers of *Linaria* are used in some districts to dye yellow. The colouring substance may be prepared best from the alcoholic extract of the flowers obtained with the assistance of heat, by washing it first with cold water, then treating it with alcohol, evaporating the alcoholic extract, and exhausting the residue with æther,



on the evaporation of which the colouring substance is left behind as a crystalline verrucose mass. Or, which is preferable, the alcoholic extract is dissolved in hot water, the solution precipitated with lime water, and the red precipitate treated with acetic acid. The solution thus obtained is evaporated, the residue exhausted with alcohol, the extract precipitated with sugar of lead, the red precipitate decomposed by sulphuretted hydrogen, filtered, the solution evaporated, and the residue treated with æther. The colouring substance may be purified by re-solution in hot alcohol, when it is obtained as a pale yellow verrucose mass. It is void of smell and taste, easily fusible, and may be sublimed without undergoing any apparent change. It dissolves with difficulty in water, more easily in alcohol, æther, and in essential oils, less so in fat oils. The solutions are of a pale yellow colour. Alkalies dissolve it with a red colour (caustic ammonia and the carbonated alkalies of a dark yellow), and the solution affords a yellow precipitate on the addition of an acid. Concentrated sulphuric acid produces a carmine-red solution, which gradually becomes darker. Hydrochloric and nitric acids likewise afford, with the assistance of heat, red solutions, which very soon however become yellow. The concentrated aqueous solution of the colouring substance affords an orange-yellow precipitate with protochloride of tin, a yellowish-red with acetate of lead, a greenish-yellow with salts of copper, a brownish one by salts of iron and protonitrate of mercury. It is not precipitated by iodide of potassium or by chromate of potash. It is thrown down of a pale yellow by alum from its solution in caustic ammonia and the carbonated alkalies. The textures dyed with flowers of *Linaria* are pale yellow, but become by exposure to the air of a dirty yellow.—*Jahrbuch für Prakt. Pharm.*, v. p. 148.

*On Quercine, the Crystalline Substance from the Bark of the Oak.*  
By G. F. GERBER.

In the analysis of some oak-bark, I observed that when large quantities are experimented on, the extractive substance contained some small crystals mixed with it. This induced me to operate on several pounds, in order to isolate the crystals and investigate their properties.

Oak-bark is boiled with water to which one-hundredth sulphuric acid has been previously added; it is then treated with milk of lime to remove the sulphuric acid, and afterwards with carbonate of potash, as long as a white precipitate, consisting of carbonate of lime and magnesia, is formed. After filtration and evaporation of the liquid to a thin extract, some alcohol of 0.863 spec. grav. is added to it. The alcohol is again removed and the liquid evaporated to a smaller volume and left in quiet for some days. The yellow crystals which separate must be recrystallized, in order to obtain them of a beautiful white; or the oak-bark is digested with milk of lime and filtered boiling. On cooling, some solution of carbonate of potash is added, upon which it is filtered and evaporated. The lime which



had been deposited is digested with alcohol of  $\cdot 863$  spec. grav., and the alcohol then poured on to the extractive residue. After distilling off the alcohol, the liquid is digested for a time with some animal charcoal, filtered, then evaporated, and placed aside to crystallize.

It forms small white crystals, which are void of smell and have a very bitter taste; is easily soluble in water, 100 parts taking up 7.3 parts quercine at  $66^{\circ}$  Fahr. A greater quantity is dissolved at a higher temperature. The solution has no action on curcuma paper, nor on reddened litmus. It dissolves in weak spirits, but not at all in absolute alcohol, æther and oil of turpentine.

Concentrated sulphuric acid has no action upon it at first, but subsequently it becomes yellowish, and then orange-yellow, and not bright red, as is the case with salicine. When quercine is heated with the sulphuric acid, the orange-yellow colour changes into a brown; and if the solution be now diluted with water, a brownish-yellow powder separates, which is soluble in alcohol, less so in water, and not at all in æther and oil of turpentine. When the solution of the quercine in sulphuric acid is diluted in water, the colour disappears and the liquor becomes transparent. On saturating the solution with barytes, the quercine is not separated, but remains in solution, from which it may be obtained on evaporation; but it now appears to be somewhat changed, for it dissolves with more difficulty in water and much easier in weak alcohol. No crystalline combination of the quercine with sulphuric acid could be obtained. Concentrated nitric acid dissolves the quercine to a colourless solution, which becomes reddish-yellow by exposure to heat, and when the action is continued for some time deposits yellow flakes. Hydrochloric and phosphoric acids form colourless solutions with the quercine, from which it is obtained on evaporation unchanged. It is evident therefore that quercine does not enter into combination with the acids.

Dilute solution of potash, and also lime-water, dissolve the quercine, but are not saturated by it.

The solution of pure quercine is not affected by the carbonate of potash, neutral acetate of lead, nitrate of silver, protonitrate of mercury, tincture of galls, and solution of gelatine.

It would appear from the above properties that the crystalline substance is quite distinct from salicine. It is contained in very small quantities in the young branches of the oak, on which account the large branches or the bark of the stem should be preferred for its preparation.—*Archiv der Pharm.* for May.

*On two Double Salts of Chromic Acid with Sulphuric and Nitric Acids. By H. REINSCH.*

In preparing chromic acid according to Fritzsche's process, the author had probably poured too large a quantity of chromate of potash into the sulphuric acid, and found, on dissolving the red precipitate of the acid with a little cold water, a large amount of a yellow



salt to remain behind. This salt was dissolved, with the assistance of heat, in a little water, and the solution placed aside; very soon some broad quadrilateral needles separated in stellate groups. The salt has a yellowish-red colour, which is somewhat lighter than that of the bichromate of potash, resembles this latter in taste, is very slightly soluble in cold water, becomes dark red by exposure to heat, giving off some aqueous vapours, after which it melts to a dark brown liquid, which solidifies on cooling to a mass having a metallic lustre, and gradually acquiring by exposure to the air a leather-brown colour. It is likewise easily soluble in water, from which it again crystallizes. The salt consists of—

Sulphuric acid. . . . .	16.21
Chromic acid . . . . .	38.64
Potash . . . . .	45.15

and is therefore  $\text{KO}, \text{SO}^3 + \text{KO}, \text{CrO}^3$ .

There is no doubt that soda and ammonia form similar combinations with these two acids. These combinations are remarkable, in so far as hitherto very few salts were known with two different acids.

The action of nitric acid on bichromate of potash is very peculiar; it dissolves easily in it to a yellow solution, which when heated to boiling becomes of a dark brownish-red, but on cooling the colour becomes somewhat lighter. If the greater portion of the nitric acid be removed by distillation, a black thick liquid remains behind, which shows no inclination to crystallization; on being again heated, some more very concentrated nitric acid passes over, the mass becomes solid, and now a large quantity of nitrous acid is disengaged. This reaction can only be explained by admitting the formation of a similar double salt, which is decomposed by heat, when the chromic acid again combines with the potash and expels the nitric acid, as the bisulphonitrate of potash behaves precisely in the same manner. The author could not succeed in obtaining the salt in a crystalline state; for when the distillation is discontinued, as soon as the evolution of nitrous acid commences, and the mass is dissolved in water, bichromate of potash is formed, and some nitre remains in the mother-ley.—*Journ. für Prakt. Chem.*, xxviii. p. 371–374.

#### *Crystallized Oxide of Lead.* By M. BEHRENS.

M. Houton-Labillardière found that oxide of lead dissolved in a solution of caustic soda, and exposed for some months to the air, crystallized from this solution in dodecahedrons of a white colour. I have accidentally obtained the same crystals, but of a yellow colour, by another method.

I mix an aqueous solution of sugar of lead with a large excess of solution of caustic ammonia; then separate by filtration the carbonate of lead formed by the carbonic acid of the water or of the ammonia, and expose the clear solution, in a well-closed bottle, to the action of the sun's rays.

After some hours, small transparent crystals are seen to form,



which at first are colourless, but gradually become yellow and yellowish-gray. They afford nearly a white powder, which ground for some time becomes of a dark reddish-brown, resembling litharge. It behaves in general as pure oxide of lead.

If the same solution be placed in darkness, for instance in a cellar, crystals of acetate of lead with 5 equivalents of base are obtained after a few days, in stellate groups, instead of oxide of lead.—*Journ. de Pharm.* for July.

### *New Crystalline Substance from Lichens.*

M. Knop has discovered a peculiar crystalline substance, with the investigation of which he is now occupied, in several lichens, in large quantity, especially in the common *Usnea florida*. It may be obtained quite simply by extracting the lichens with æther, and then submitting the solution to distillation. It crystallizes in minute sulphur-yellow prisms, melts at 392° Fahr., is not volatile, insoluble in water, and contains no nitrogen.—*Archiv der Pharm.* for June.

### *Action of Potassa on the Oxide of Copper, Protoxide of Copper, Peroxide of Iron, and on Silver.* By M. CHODNEW.

It is stated in all works on chemistry, that the oxide of copper is insoluble in potash. According to Berzelius, the oxide of copper does not dissolve in the moist way in potash or in soda; and when these oxides are heated together to redness a green mass is obtained, which, treated with water, abandons the alkali, while the oxide of copper remains undissolved. This oxide expels, under similar circumstances, carbonic acid from the alkaline carbonates. Mitscherlich likewise states that a solution of potash precipitates the copper salts of a light blue, and that the precipitate is insoluble in an excess of the reagent.

Only Gmelin, when describing the experiments of Proust, mentions that the oxide of copper dissolves in an excess of potash, and that when the solution is diluted with a considerable quantity of water, the precipitate is again formed.

M. Chodnew having observed in some analytical investigations that the oxide of copper was dissolved by potash under certain circumstances, made some direct experiments on the subject.

A fragment of the hydrate of potash, kept in a state of fusion for ten minutes in a crucible of chemically-pure copper, with free access of air, afforded a deep blue mass, which on cooling became slightly green on the surface. According to the opinion generally admitted, the copper of the crucible becomes oxidized in this operation at the expense of the oxygen of the water combined with the potash, and oxide of copper is formed, which unites with the potash. M. Chodnew believes, on the contrary, that it is not the oxide but the protoxide of copper which is produced at the expense of the oxygen of the water, and which, under the influence of the oxygen of the atmosphere, is converted into peroxide; for if the operation



be carried on, the air being excluded, no peroxide but only protoxide of copper is obtained. The fused and cold mass is not decomposed on being placed in contact with water, as is generally admitted, into hydrate of potash and peroxide of copper. A considerable portion of the latter dissolves, and imparts to the solution a bluish tint, analogous to that of a solution of oxide of copper in ammonia. The oxide of copper which separates is at first black, but subsequently becomes brown. This operation presents a phenomenon which it is not very easy to account for. If the solution is filtered immediately after the immersion of the mass in water, it preserves its blue colour for an indefinite time, and the oxide of copper remains dissolved; but if the solution is allowed to remain in contact with the undissolved oxide, it gradually loses its colour, and in a few days it contains no more oxide of copper. The affinity of the potash for the oxide of copper is probably so weak that the presence of the latter suffices to destroy the combination. The same result is obtained on fusing the oxide or protoxide of copper with potash in a silver crucible.

M. Chodnew found that the quantity of peroxide that dissolved in the potash was not in proportion to the amount of potash employed. For instance, a solution containing 12.7 grms. of hydrate of potash contained 0.0735 oxide of copper; a second, with 11.6 hydrate of potash, had only taken up 0.058 oxide of copper. The author nevertheless adds, that the amount of oxide which dissolves does not absolutely depend on the time during which the mass was kept in fusion.

The principal tests produce in these solutions the same reactions as in acid solutions, but in a weaker degree.

M. Chodnew has moreover observed, that when a large excess of solution of caustic potash is added to solutions of the sulphate, nitrate, or chloride of copper, the precipitate which forms is entirely redissolved, and gives rise to a blue solution. These facts had been observed long ago by M. Roloff, but had entirely escaped the attention of chemists. Some precautions are however necessary. The solutions of the copper and of the potash should not be warm; otherwise some brown oxide of copper would be immediately formed, which dissolves with far greater difficulty in the potash than the hydrated oxide. The solution of the copper must also be very dilute, or there would also be some brown oxide formed by the heat evolved. Much less oxide of copper is taken up by this process than by fusion; 0.13 gr. oxide of copper requires somewhat more than 50 grs. hydrate of potash in order to dissolve. The solution, far from being rendered opaque by boiling, becomes more clear; an excess of water does not precipitate any metallic oxide, as is asserted by Proust. The calcined oxide also dissolves in potash after long-continued boiling. The potash dissolves a larger quantity of oxide of copper, and with greater ease, the more concentrated the solution.

When hydrate of potash is fused in copper crucibles, to which the air has no access, a red mass is obtained on cooling, which dis-



solved in water leaves behind a residue of protoxide of copper in the form of a brick-red powder. A small quantity however of this latter remains in solution.

Protoxide of copper is also dissolved by boiling in an excess of hydrate of potash. The author ascertained this fact, both with recently-precipitated protoxide of copper, and with some which had been previously heated to redness. The result was the same in both cases. The solution is colourless; it becomes brown by sulphuretted hydrogen, and when left to itself deposits sulphuret of copper.

M. Chodnew has likewise proved that the peroxide of iron is soluble in potash, either by long-continued boiling of the hydrated peroxide, recently prepared with a solution of potash in a platinum dish, or by fusing potash at a red heat in an iron crucible, and dissolving the cold mass in water. In both cases a liquid is obtained of a slightly yellowish colour, which contains peroxide of iron in solution.

Peroxide of iron, which has been previously heated to redness, does not dissolve, nor does the recently-prepared hydrate when the solution of potash is dilute, so that precipitates of alumina and peroxide of iron may be separated without fear by means of a dilute solution of potash.

Although silver resists better than the other metals, with the exception of gold, the solvent action of potash, it does not withstand it altogether; for M. Chodnew obtained a yellowish mass, on fusing some potash for a few minutes in a silver crucible. Dissolved in water after cooling, the fused mass left behind a black powder, which consisted of a mixture of oxide of silver and of metallic silver, but the solution did not contain a trace of the metal.—*Journ. für Prakt. Chem.*, xxviii. p. 217.

*On some new Combinations of Cyanogen. By A. MEILLET.*

The peculiar behaviour of cyanogen towards iron in forming two very stable acids, ought to have led to the suspicion that this body was not the sole one with which that powerful metalloid, cyanogen, would combine. Some German chemists, among others Gmelin, have indeed discovered three new combinations, viz. platino-cyanogen, cobalto-cyanogen, and chromo-cyanogen, and also the hydrogenated acids, analogous to the ferrocyanic acid and several other metallic salts. The processes which they employed being somewhat complicated, they did not carry their experiments further. The method which I follow is more simple, and I am able to obtain a large number of these well-defined compounds. As their investigation requires much time and care, I will at present only describe the principal characters of these salts; in a subsequent paper I will give their analyses.

*Auro-cyanogen—Auro-cyanide of Potassium.*

This salt is obtained by adding to pure cyanide of potassium, prepared according to Liebig's method\*, a saturated solution of

\* For a description of this method see page 526 of the present Number.—Ed.



perfectly neutral chloride of gold. The solution is evaporated; on cooling the salt crystallizes in very white scales of a pearly lustre; chloride of potassium and the excess of cyanide remain in the mother-ley. This crystallized salt is far better adapted for electro-gilding than the solutions now generally used.

*Platino-cyanogen—Platino-cyanide of Potassium.*

Döbereiner, who discovered this salt, prepared it by heating to redness a mixture of equal parts of spongy platinum and of ferro-cyanide of potassium. The mass is lixiviated, then crystallized to remove by degrees the undecomposed prussiate; when at last the platino-cyanide is contained in the mother-ley, from which on concentration it crystallizes. This process is tedious, and it is difficult to obtain the salt pure. To prepare it I convey some concentrated chloride of platinum into a saturated solution of cyanide of potassium; a precipitate of chloride of platinum and potassium mixed with the cyanide is immediately formed; this is heated to boiling, when it redissolves with a very brisk effervescence and a considerable disengagement of carbonate of ammonia. It may be supposed that in this case the cyanide of platinum which has been formed acts as an acid on the atom of cyanate of potash always contained in this cyanide of potassium, liberates the cyanic acid, which by absorbing 3 atoms of water is converted into bicarbonate of ammonia. In fact, cyanic acid being  $\text{C}^2 \text{N O}$ , we have with 3 atoms of water  $\text{H}^3 \text{O}^3$ ,  

$$1 \text{ atom of bicarbonate of ammonia } \dots\dots\dots \frac{\text{C}^2 \text{O}^4, \text{N H}^3}{\text{H}^3 \text{O}^3}.$$
After the entire solution of the precipitate it is allowed to cool, when the platino-cyanide of potassium separates in blue acicular crystals, which are yellow by transmitted, iridescent purple by reflected light.

*Cupro-cyanogen—Cupro-cyanide of Potassium.*

This is prepared by dissolving some cyanide or carbonate of copper with the assistance of heat, in cyanide of potassium and evaporating; on cooling it separates in very beautiful white acicular crystals.

When, after having poured some very concentrated hydrocyanic acid over some hydrate of barytes, carbonate of copper is added, it dissolves with brisk effervescence, and the liquid assumes a carmine-red tint of extraordinary intensity. On evaporating the solution quickly, the solution gradually becomes decolorized to such an extent, that, on treating the residue towards the end with some cold water, I obtained perfectly-colourless cupro-cyanide of barium. I endeavoured to find out the cause of this colouring, which I at first thought was owing to the formation of a double salt, but I subsequently discovered that it was due to the formation of a considerable quantity of murexide or purpurate of ammonia. I have sought in vain to explain the reaction which could have given rise to it, seeing the large amount of hydrogen contained in this body. Once or twice I found some rudiments of crystals, which had been pro-



duced spontaneously, and were of the colour of cantharides' wings, a tint which sufficiently characterizes it.

This solution of cupro-cyanide of barium, evaporated to dryness and heated gently as above directed, then treated with water, leaves a residue of carbonate of barytes. On adding a diluted acid, for instance hydrochloric acid, into the red solution of the cupro-hydrocyanate and purpurate of barytes, purpurate of copper is precipitated, hydrocyanic acid is evolved, and in the solution remains only hydrochlorate of barytes. This purpurate is obtained in the form of a beautiful deep violet powder. The red salt of barytes, treated with sulphate of soda, abandons the barytes, and the solution then contains a mixture of purpurate and cupro-cyanate of soda, which may be sufficiently well separated by spontaneous evaporation. The purpurate creeps up the sides of the dish; it crystallizes in cauliflower-like masses of a beautiful purple colour, which are not effected by exposure to the air. The cupro-cyanide of sodium remains at the bottom of the dish in the form of minute acicular crystals, which are likewise unalterable in the air.

#### *Argento-cyanogen—Argento-cyanide of Potassium.*

This salt crystallizes readily in square rectangular prisms, analogous to chlorate of potash. It is obtained by dissolving to saturation cyanide of silver in cyanide of potassium, filtering and evaporating, when the salt crystallizes.

*Argento-cyanic acid* is prepared by dissolving cyanide of silver in cyanide of barium, and then precipitating the barytes with sulphuric acid; it is of a yellow colour, tolerably stable, possessed of the odour of hydrocyanic acid; it is very weak, but combines nevertheless very well with the alkaline bases, with more difficulty with the carbonates.

#### *Hydrargyro-cyanide of Potassium.*

This salt is analogous to the preceding, and is prepared in the same manner. It is white, very soluble, and is obtained in the form of minute granular crystals. Similar combinations may likewise be obtained with a great number of other salts, such as salts of cobalt, of nickel, cadmium, &c., which I will describe on some future occasion.—*Journ. de Pharm.* for June.

#### *Atomic Weight of Calcium.*

Dumas had fixed the atomic weight of this element at 250, or exactly 20 times the weight of an equivalent of hydrogen, which was subsequently confirmed by Erdmann and Marchand. According to Berzelius, who has recently made some experiments on the subject, that number is not correct; the true atomic weight is 251.9. According to this, lime consists of—

Calcium .....	71.6
Oxygen .....	28.4

*Archiv der Pharm.* for June.



## ANALYTICAL CHEMISTRY.

*On the Determination of Iodine in Mineral Waters.**By M. BONJEAN.*

THE presence of iodine in mineral waters being a very important point to ascertain in therapeutics, many chemists have engaged in seeking proper means for attaining this object; but among the methods hitherto suggested, some offer great inconveniences in their application, while others are tedious and difficult, and all require on the part of the operator experience in chemical manipulation. I endeavoured to find a process which would possess at the same time the twofold advantage of indicating the smallest traces of iodine in any liquid whatsoever, and of offering in its execution all the simplicity, ease and promptitude desirable.

I believe I have attained this object by having recourse to a reagent which is found everywhere, and may be had at a very low price, it is nitric acid. I confirmed, by repeated experiments, that by means of chlorine it is barely possible to detect the presence of  $\frac{1}{200000}$  of an alkaline iodide in a solution, while nitric acid shows the existence of a quantity twenty times less of the same iodide, that is  $\frac{1}{4000000}$  of the weight of the solution.

The following is the mode of operating:—A certain quantity of the mineral water is conveyed into a porcelain crucible; to this is added a small quantity of solution of a starch, upon which a drop of nitric acid is let fall on the mixture until a violet, lilac, or rose colouring is evident at the bottom of the crucible, according to whether the water is more or less rich in iodine; the whole is then stirred with a glass rod, and if the colour first obtained by the action of the acid becomes weaker, or disappears by the agitation, a fresh portion of acid is added, always in drops, and continually stirring until the maximum of coloration has been attained. It is easily seen when this point has been arrived at, from the intensity of the colour produced increasing no further by the addition of the last drop of acid. A larger excess of acid would cause the colour to disappear.

When a mineral water containing much sulphur is to be operated on, it is first requisite to remove this; but this operation may be dispensed with if the water contain but a very small proportion of the sulphurous principle.

The solution of starch should be employed in a concentrated state, and in excess when only traces of iodine exist in the liquid under examination. It must also be as fresh as possible. However, it may be preserved in good condition for a month or two if kept in a cool place.

I have succeeded, by means of this process, in detecting the presence of iodine in the Island lichen, in the *Fucus crispus*, *Fucus helmintocorton*, white coral, and in the sponge, by operating on a simple infusion of these substances, with the sole precaution of first decolorizing the infusions by means of charcoal.



By means of nitric acid I have also easily detected the presence of iodine in the sulphurous waters of Chevillard, situated about half an hour's walk from Aix in Savoy, while by the ordinary processes I had not been able to find any even when operating on the residue resulting from the concentration of 15 kilogrms. of the water.—*Journ. de Pharm.* for July.

*New Process for distinguishing between, and for the Absolute Separation of Arsenic from Antimony.* By M. BEHRENS.

Several methods have of late been described for the distinction and separation of arsenic from antimony in medico-legal investigations, and among these the process of M. Pettenkofer, amended by M. Fresenius\*, is so satisfactory in examining cases of poisoning, that the subject may almost be thought to have attained the highest degree of perfection.

Nevertheless we are still unacquainted with a precise and practical method in quantitative analysis for separating these two bodies, especially when in small quantities. I have for some time separated them quantitatively, for instance in the analyses of scorïæ, by the following simple and sure method:—

I convert the arsenic and antimony into sulphurets, and add to the mixture while still moist an equal volume of neutral nitrate of lead and about as much water. I boil the mass in a porcelain dish, stirring without interruption, and renewing the water which evaporates until the whole has acquired a dark brown colour. I then convey it on to a filter.

The residue contains the entire amount of antimony and a portion of the arsenic. The way in which this has to be treated will be noticed further on. The solution, which contains nothing further than arsenious acid, nitric acid and oxide of lead, is treated with carbonate of ammonia as long as any precipitate is formed. I then add to the liquid separated by filtration from the carbonate of lead, some hydrochloric acid, until it has an acid reaction, and pass a current of sulphuretted hydrogen through it.

The sulphuret of arsenic obtained is free from all trace of antimony.

To separate the arsenic contained in the state of sulpho-arsenuret of lead in the mass which had remained on the first filtration, I digest it at a gentle heat with some caustic ammonia, which converts the sulpho-arsenuret of lead into sulphuret of lead and sulphuret of arsenic, which latter dissolves in the ammonia. To the filtered solution I add a little hydrochloric acid, and add the sulphuret of arsenic precipitated to that first obtained.—*Journ. de Pharm.* for July.

*Method of detecting Soda in Potash.*

M. Roder takes advantage of the formation of the scarcely-soluble oxalate of soda, and of the fact that acetate of potash is decomposed

\* Chem. Gaz., p. 147.



by oxalic acid only when employed in great excess. He saturates therefore, for this purpose, the dried sample of potash with concentrated acetic acid, and then adds an aqueous solution of an equal weight of oxalic acid. If the amount of soda is not too inconsiderable, a granular precipitate is immediately formed, which is filtered, dried and calcined, to convert it into carbonate of soda. 4 to 5 per cent. of soda may readily be detected in potash by this method, which the author regards as sufficient for ordinary purposes.—*Jahrb. für Prakt. Pharm.*, vi. p. 44.

### *Mode of employing Starch as a Test.*

M. Herberger recommends as a very convenient mode of employing this reagent, bands cut from the transparent and elastic membranes obtained by cautiously drying thin layers of starch-paste.—*Jahrb. für Prakt. Chem.*, v. p. 228.

## PHARMACOLOGY.

### *Observations on Lobelia inflata.* By H. REINSH.

THE *Lobelia inflata*, which was first introduced into medicinal use by Cartwright, is a native of North America. As far as any comparison could be made with a drug imported from so great a distance, it differs somewhat from the plant cultivated under that name in our gardens. Two different kinds are at present met with in commerce, which may easily be distinguished by the peculiar mode in which they are packed.

I. The packet is 8 inches long,  $2\frac{1}{2}$  inches broad, and of the same thickness, enveloped in blue paper; on the upper side is a square label in yellow paper, bearing the inscription—

“ *Lobelia*  
*Lobelia inflata*  
*New Libanon*  
No. 6.”

The contents consist almost solely of yellow stems covered with rigid hairs, with alternating branches, and are pressed flat. Among them occur a few ovate, dentate, hairy leaves and flower-stalks. On the latter are situated the ten-ribbed, obtuse-dentate calyx in a loose terminal raceme; but sometimes there occur among them flower-heads, on which there are five or more flowers near to each other, which have 5-dentate calyces, and resemble completely those which grow in our gardens. The stems moreover are cut off perfectly smooth on all four sides of the packet. Such a parcel weighs about half a pound, and costs three shillings.

II. The second kind occurs in larger flat packets, which are likewise enveloped in blue paper, and are very much compressed. On



the upper side is a narrow strip of yellow paper, on which are the words—

“ *Lobelia inflata*  
*Indian Tobago.*”

It is 8 inches long, 4 inches broad, and  $1\frac{1}{2}$  inch thick. It weighs about a pound, and is therefore as heavy again as No. I., but it only costs four shillings; is therefore one-third cheaper than the first kind. The contents consist generally of green, with only a few reddish, stiff-haired stems, with numerous leaves; but no flowers could be found on them. It has a far more intense smell, resembling in some degree tobacco, than the *Lobelia* in the smaller parcels; the taste, on the contrary, is much weaker. At all events the former has been collected before the flowering-time, the latter during or after that period, and to judge from taste is decidedly preferable. Nor has the kind No. II. been collected with so much care and cleanliness, for I found among them feathers, dung, halms of *Phleum* and of *Plantago*, and also a considerable quantity of small black seeds, which were probably derived from the latter plant. The following experiments were made with the kind No. I:—

The decoction is slightly brownish, does not froth, has a peculiar acrid taste, especially in the throat, is rendered slightly turbid by alcohol and acids, is coloured brown by ammonia, not blue by iodine; acetate of the peroxide of iron causes a brownish-green turbidness in it, acetate of lead an abundant yellow precipitate, and tincture of galls a white one.

By distilling the herb with water, a neutral milky liquid is obtained, which has a smell resembling hay, from which an essential oil of a mild taste, but possessing a rather strong odour, may be separated in small quantity.

The analysis gave the following result:—

Water .....	0·110
Essential oil.....	undeterminable.

*Alcoholic Extract.*

Chlorophylle } Wax ..... } Resin ..... } Stearine ... }	0·055
Peculiar principle ( <i>Lobeline</i> ) .....	0·022
Aromatic resin .....	0·013
Vegetable gelatine .....	0·028

*Aqueous Extract.*

Mucous gum .....	0·060
Salts of potash, lime, magnesia, iron, and manganese, with organic and inorganic acids ..	0·024

*Extract with Potash.*

Mucous gum .....	0·424
Vegetable fibre .....	0·266
	<hr/> 1·002



The so-called Lobeline was obtained by treating the spirituous extract which had been exhausted by æther, with alcohol of 0·819 spec. grav., evaporating the solution and extracting the residue with water. On evaporating the yellowish-brown solution, which has an acid reaction and a slight bitter, and subsequently extremely acrid taste, resembling very closely that of tobacco, the lobeline remains behind. When dried, it forms a shining, faintly-yellowish, hygroscopic gummy substance, which melts easily on platinum-foil, giving off acrid vapours, which possess a very peculiar smell; it swells, then inflames, and burns with a bright flame. The coal is very difficult to consume, but it leaves scarcely a trace of ashes behind. It is easily soluble in water and in alcohol, but not in æther. The aqueous solution froths very little on shaking. Ammonia does not produce any turbidity in it; it merely renders its colour somewhat darker. Acids have no effect on the solution. Tincture of iodine produces, even in very dilute solutions, a reddish-brown opakeness. Tincture of galls throws down a voluminous white flocculent precipitate. Acetate of the peroxide of iron imparts a dark brown colouring. Acetate of copper, acetate of lead, solution of tartar-emetic, muriate of the protoxide of tin, and solution of corrosive sublimate, have no action on it. Protonitrate of mercury produces a light yellow, nitrate of silver a white precipitate, which very soon passes into reddish-brown.

It is evident that the lobeline prepared in this manner is not perfectly pure; it still retains tenaciously some of the nitrogenous gelatinous substance, from which it cannot be entirely separated even by treatment with absolute alcohol and water.

The soluble portion of the spirituous extract, which was insoluble in strong alcohol, has been enumerated under "*Vegetable gelatine*." It forms a gummy substance, which when dry is brittle and of considerable lustre; it has a bitter taste, and its solutions froth very much on being agitated. On burning, it evinces evident signs of containing nitrogen, but the solution does not coagulate on being boiled.

The substance enumerated as *mucous gum*, both in the aqueous decoction as well as in the alkaline extract, does not form a gelatinous mass with alcohol or with acids, nor does it afford pectic acid or humine by boiling with alkalies, but is precipitated as a slimy mass. It is not coloured by iodine.—*Jahrb. für Prakt. Pharm.*, v. p. 292.

For the sake of comparison, we have been induced to insert some experiments of Dr. Pereira on the same subject, taken from his 'Materia Medica:—

"No accurate analysis of *Lobelia* has hitherto been made. Dr. Colhoun has announced the existence of a peculiar principle of this plant. From a few experiments which I have recently made on *Lobelia*, I find that it contains a *volatile acrid principle* (oil?), an *acid* (peculiar?), *resin*, *chlorophylle*, *gum*, *extractive woody fibre*, and perhaps *caoutchouc*.

"1. *Volatile Acrid Principle* (Volatile Oil of Lobelia? Lobelia-



nine?).—Water distilled from *Lobelia* has the peculiar smell and the nauseous acrid taste of the plant. In one experiment I obtained a thin film of what appeared to be a solid volatile oil. The distilled water of *Lobelia* is unaffected by acids, sesquichloride of iron, and tincture of nut-galls.

“2. *Lobeline*?—The substance described by Colhoun is said to resemble the *nicotine* of Berzelius. It is soft, brown and deliquescent, and has the acrid taste of *Lobelia*. It is soluble in alcohol, scarcely so in æther; with acids it forms salts (Colhoun). By evaporating the tincture of *Lobelia*, and digesting the residue in dilute hydrochloric acid, I have obtained a yellowish-brown extract (*impure hydrochlorate of lobeline?*), soluble in alcohol, insoluble, or nearly so, in æther, and having an acrid taste like that of *Lobelia*, but stronger. Tincture of nut-galls added to the aqueous decoction of *Lobelia* causes slight cloudiness (*tannate of lobeline?*).

“3. *An Acid* (Lobelic? Acid).—A decoction of *Lobelia* reddens litmus, and becomes, on the addition of sesquichloride of iron, dark olive-brown; and in a short time a precipitate is formed (*lobeliate? of iron*). A solution of isinglass produced no obvious change in the decoction, showing the absence of tannic acid. Sulphate of copper gave rise to a green precipitate (*lobeliate? of copper*). Nitrate of silver caused a slight precipitate (*lobeliate? of silver*) soluble in nitric acid. The effect produced by the salts of iron on decoction of *Lobelia* is analogous to that caused by the same agents on aloes and cebadilla.

“4. *Resin*.—By gently evaporating the tincture of lobelia (prepared with proof spirit), a resinous substance separates, and floats on the surface of the liquid. It has an exceedingly acrid taste.”

#### *On some Indian Articles of Materia Medica.*

[Continued from page 464.]

**COCCULUS CORDIFOLIUS.** Nat. ord. *Menispermaceæ*. Vern. Guluncha, Gudancha, &c.

This is one of the most common and valuable plants in India.

The root is large, soft and spongy, and when fresh is used extensively by the natives of Bengal, being mixed with sour rice-gruel and sugar, for the cure of heat of urine in gonorrhœa. An extract called *Paolo* is procured from the stem, and is used, dissolved in water, for the same purpose. The stems, roots and leaves are bitter, and afford a decoction called *Pachana*, much used as a bitter tonic in convalescence from fevers and acute diseases generally.

The *Paolo* is prepared by cutting the stem into small pieces, which are cleaned and bruised in a mortar, then soaked in water for 24 to 48 hours. The mass is then squeezed between the palms of the hands, and the woody particles separated from the fluid, which is strained through a cloth. The solution is evaporated to dryness before the sun, and when dry the residue resembles sugar; the dose is  $\frac{1}{2}$  a rupee to 1 rupee weight, taken with sugar, milk and rice gruel.

The decoction of *Pachana* is made from 2 to 5 rupees weight



of the stem cut into small pieces, bruised in a mortar, and boiled with a pound ( $\frac{1}{2}$  a seer) of water down to 2 oz.; this is then strained and drunk with honey. An infusion in cold water is also prepared, and is much employed in the treatment of cutaneous diseases.

In several trials made at the College Hospital, the guluncha was found to be a very useful tonic, but we could scarcely attribute to it any very decided febrifuge effect. The decoction or cold infusion, used in the same manner as sarsaparilla, was of very great utility in the treatment of several cases of chronic rheumatism and of secondary venereal affections. Its action is decidedly diuretic and tonic in a very high degree.

BERBERIS LYCIUM. Nat. ord. *Berberaceæ*.

*Rusot* is a watery extract prepared in the hilly districts of India from the sliced root, stem and branches of this plant. This extract is to be found in all the bazaars, and is much employed by the native practitioners.

*Rusot* of best quality is a pale yellow, uniform, pasty extract, soluble in water and alcohol, to which it communicates a brilliant yellow colour, exceedingly bitter to the taste, of rich heavy smell, blackened by salts of iron, precipitated by solution of gelatine, and consequently containing tannic and gallic acids.

We were induced to use it internally as a tonic, in consequence of the popular reputation in Europe of the bark of the common barberry as a remedy for agues. We were also aware that M. Buchner had used *Berberine* as a tonic as far as ten-grain doses with considerable benefit. Lastly, the intense bitterness of this principle, and its yielding azote on ultimate analysis, led us to anticipate its utility in the treatment of periodical fevers.

*Rusot* is best given as a febrifuge in half-drachm doses diffused through water, and repeated thrice, or still more frequently, daily. It occasions a feeling of agreeable warmth at the epigastrium, increases appetite, promotes digestion, and acts as a very gentle but certain aperient. The skin is invariably moist during its operation.

In over thirty cases of tertian ague (several complicated with spleen) we have succeeded in checking the fever, on an average within three days after commencing the *rusot*. In eight cases of quartan six were cured. The cases of common quotidian thus successfully treated were so numerous that they were not recorded. In no instance was headache or constipation produced, but we have seen *rusot* exasperate the symptoms of chronic dysentery and hepatitis when complicated with ague.

On the whole we deem the *rusot* a most important accession to our *Materia Medica*, and worthy of being substituted in a multitude of cases for cinchona bark. Its aperient action renders it especially valuable.

The *rusot* is manufactured in Nipal and the Dhoon, at about 8 annas the seer. What is found in the Bengal bazaars is usually of a very inferior description, old, mouldy, black, and mixed with half its weight of impurities.



CUCUMIS UTILISSIMUS. Nat. ord. *Cucurbitaceæ* Vern. Kankoor, Beng. Kakni, Hind.

This plant is cultivated in the higher lands of Bengal. The powder of the toasted seeds is described as a powerful diuretic, and serviceable in promoting the passage of sand or gravel.

#### CUCUMIS COLOCYNTHIS.

The pulp and seed of the colocynth produce exceedingly powerful cathartic and emetic effects, from large doses amounting to acrid poisoning. The alcoholic or watery extract, however, when given in proper doses, and combined with milder purgatives, constitutes one of the most valuable of our medicinal resources. The compound extract of our Pharmacopœia contains, besides the alcoholic extract of colocynth, aloes, scammony, cardamums and soap. It is an excellent purgative, especially when given with blue pill or calomel. The dose is 5 to 10 grs.

Dr. O'Shaughnessy says this plant is likely to become a profitable export from India, either in the state of fruit or extract, and to be quite equal to that derived from the Levant.

A colocynth which is abundant and cheap in the bazaars, and termed "Bislombhee," Dr. O'Shaughnessy thinks is the true colocynth, but Dr. Royle regards it as a distinct species, which he terms *Cucumis pseudo-colocynthis*.

PLUMBAGO ROSEA. CHITA. Nat. ord. *Plumbagineæ*.

Dr. O'Shaughnessy gives an account of numerous clinical experiments made with the bark of the plumbago root of various species, especially the *P. rosea*, rubbed into a paste with water and a little flour or congie. It occasions pain in about five minutes, which increases in severity, till in a quarter of an hour it is equal to that of a cantharides blister or mustard sinapism. If the paste be removed in half an hour, the pain is soon allayed; and in a period of 12 to 18 hours a large uniform blister, full of serum, is occasioned. The blistered surfaces heal readily without unpleasant ulceration.—Abstracted from Dr. O'Shaughnessy's *Bengal Dispensatory*.

## CHEMICAL PREPARATIONS.

*Description of a very Simple Process for preparing Hyposulphite of Soda.* By M. WALCHNER.

HAVING received an order for several pounds of this salt, which of late has come into very extensive use, both for preparing as well as for gilding Daguerreotype portraits, I was induced to search for a more simple method of preparing it than that generally followed. I found that this salt may be obtained in a very short time and in great quantity by the following simple process:—Pure crystallized carbonate of soda is dried as much as possible and reduced to a fine



powder; 1 lb. of it is then mixed with 10 oz. of flowers of sulphur, and the mixture heated in a glass or porcelain dish gradually until the sulphur melts. The mass which cakes together is kept at this temperature, and is divided, stirred and mixed, in order that each part may be brought into contact with the atmosphere. The sulphuret of sodium formed passes, under these circumstances, by the absorption of oxygen from the atmosphere, with a slight incandescence, gradually into sulphite of soda. It is dissolved in water; filtered, the liquid immediately boiled with flowers of sulphur; the filtered, nearly colourless, strongly concentrated liquid affords hyposulphite of soda in very pure and beautiful crystals and in large quantity.

When the mixture is heated too quickly some sulphur is easily burnt; there then remains a portion of undecomposed carbonate of soda, which contaminates the hyposulphite in the first crystallization, but which may very readily be separated from it.—*Ann. der Chem. und Pharm.* for May.

*Sapo Kali Hydriod.*, according to HAEUSELER.

*Sapo sebi*, ʒvj; *Alcoh. vini.*, ʒxβ; *Kali hydriod.*, ʒxj, gr. xv; *solve in cucurbita vitrea et filtra.* The warm solution is conveyed into opodeldoc phials. The preparation keeps better than the unguent of iodide of potassium.—*Jahrb. für Prakt. Pharm.*, vi. p. 119.

*On the Syrup of Balsam of Tolu.* By M. SOUBEIRAN.

M. E. Marchand of Fecamp has proposed for the preparation of the syrup of Tolu balsam the following formula:—

R̄ Tolu balsam.....	16
White sugar.....	32
Common water, cold .....	60
Simple syrup, cold .....	1000

Triturate the balsam with the sugar to an impalpable powder, place it in a vessel of porcelain or of tin, mix with water, and pour on it the syrup while boiling. Stir well from time to time till cold, covering it while at rest, and filter through paper after twelve hours of contact.

M. Marchand wished by this formula to succeed in diminishing the dose of Tolu balsam without rendering the product less advantageous. He thought that the sugar-syrup acting on the balsam divided by the sugar, would be much more apt to dissolve the soluble parts than with pure water alone.

The syrup made according to this formula is agreeable, but what syrup of Tolu is not? I regard it as much weaker and less agreeable than that of the Codex.

The Codex prescribes the balsam of Tolu and the sugar to be taken in the proportion of 1 : 8. In accordance with M. Deville's observations, I found by experiment, that without altering the quality of the syrup, this proportion might be reduced one-half, and adopted



accordingly that of 1 : 16. M. Marchand raises it to 1 : 44. After having convinced myself, by a first experiment, that the syrup of M. Marchand was not sufficiently charged, I made another, following his formula, but employing a fourth of the balsam prescribed by the Codex. I already knew that with this dose the product is too weak in flavour and in smell when prepared by the direct action of the water on the Tolu balsam ; I therefore followed the manipulation advised by M. Marchand, and this time obtained a syrup more charged, which several persons found good and agreeable, until I made them taste the syrup of the Codex after it. This has a pleasant perfume and a soft agreeable taste, far superior to that of the syrup of M. Marchand. The latter offends by its odour, but especially by its resinous acerbity. An amateur gourmand will not hesitate a moment between the two products ; I therefore advise employing the Tolu balsam in the proportion of 1 to 16, making a first liquor by the digestion of the balsam of a previous operation, and employing this infusion in the treatment of a new quantity of fresh balsam.—*Journ. de Pharm.* for July.

#### *Volatile Oil of Canella alba.*

MM. Meyer and Reiche have found the above oil to contain at least three different oils:—1st, a heavy oil, which combines with bases, and is perfectly identical in odour and composition with peppermint oil ; 2nd, a light oil, which constitutes by far the larger portion, and which appears to be identical with cajeput oil ; and 3rd, a heavy oil, which does not combine with bases, and is present only in small quantity. They have also confirmed the statement that this bark contains an unusually large amount of mannite (above 8 per cent.).—*Archiv der Pharm.* for June.

#### *Lactate of the Protoxide of Iron.*

M. Roder prepares this salt by adding iron-filings to milk, to which sugar of milk has been added, immediately on its commencing to become acid. It is then set aside until all action has ceased, the air being excluded as much as possible ; it is filtered quickly through linen and evaporated briskly. Should the crystals not prove sufficiently white, they may be washed with a little cold water on the funnel.—*Jahrb. für Prakt. Pharm.*, vi. p. 45.

#### *Preparation of Cyanide of Potassium.*

The following is Professor Liebig's process alluded to at p. 514:—  
Take 8 parts of prussiate of potash, reduce to a powder, and dry sharply ; then mix it with 3 parts of well-dried carbonate of potash, which must be free from sulphates ; fuse together, and when the mass is fluid, stir well with a rod ; allow it to subside, and then pour off on to a marble plate ; the cyanide solidifies to a crystalline mass.—*Phil. Mag.* for April 1842.



## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*On the Employment of the Essential Oils from Coal, Schist, &c., for the Purposes of Illumination.* By MM. BUSSON-DUMAURIER and ROUEN.

THE liquid hydro-carburets, so abundant in the form of essential oils and naphthas from schist, coal, turpentine, &c., may at present be employed for the purposes of illumination, by means of the processes of MM. Busson and Rouen, *without any alcoholic admixture*. The proportions of carbon which enter into the composition of these essential oils are such, that hitherto it was found impossible to consume the whole of the smoke even with the most energetic draught chimneys.

The authors of the Memoir presented to the Academy have succeeded in obtaining a perfect combustion of these oils by a process as novel as it is simple. A jet of vapour of the oil from coal, schist, &c., projected free into the atmosphere under a pressure of from 1 to 6 centimetres mercurial, inflames and burns without smoke; and this complete combustion, as they observe, is due to the very excess of carbon contained in this kind of vapour; so that they have found the remedy in the very cause of the evil. In fact, from the vapour of the oil being very carbonaceous and its combustion highly fuliginous, it is less inflammable than vapour of alcohol for instance, and it results that by giving to the jet of this vapour a certain velocity it will no longer inflame at the orifice of emission, but only at a distance of some centimetres from this orifice, at that point where on the one hand its velocity will have considerably decreased, and where on the other hand it will have assimilated to itself a quantity of air (from 4 to 5 times its volume) sufficient to render its combustion perfect.

This principle once well understood, it was easy to deduce from it, as the authors have done, a very simple apparatus, which may be represented by a reversed siphon having a large branch terminated by an expansion which serves as a reservoir, and a small branch terminated by a narrowing which gives rise to the jet of vapour. The apparatus thus arranged, there only remains to adapt on to the extremity of the small branch bearing the jet a short metallic chimney, in which inflammation is effected and carried on, so that the origin of the blue and faintly-lighting flame remains confined in this chimney in order to heat it and support the evaporation, while the prolongation of the flame beyond the chimney diffuses around the most brilliant light.

On stopping up the upper extremity of this chimney, and piercing several circular apertures of from 2 to 4 millimetres in diameter, the flame then escapes in a corona of a very regular form. Thus divided, the combustion is more calm and less noisy.

The quality of the flame is very remarkable; its intensity is equal at least to that of olefiant gas.



Independently of the scientific interest which the invention of Messrs. Busson and Rouen offers, it is of the greatest importance in an œconomical point of view. If, as there is every reason to believe, the material for this light can be furnished to the consumer at the price of 20 francs for the 100 kilogrammes, there would result the following proportions of cost compared with the existing means of lighting :—

The new light would be to that by gas as 1 to 6.

The new light would be to that by oil as 1 to 8.

That is, it would furnish at the same price, with profit, four times as much light as gas and six times as much as oil.—*Journ. de Pharm.* for July.

[We believe that this is similar in principle to the light patented under the name of Pelletan.—ED.]

## PATENTS.

*Patent granted to William Longmaid, Plymouth, for Improvements in treating Ores and other Minerals, and in obtaining various Products therefrom, certain Parts of which Improvements are applicable to the Manufacture of Alkali.*

THE invention consists in treating ores and minerals containing sulphur with such proportions of common salt that the ores are deprived of their sulphur, or nearly so, and the metallic products resulting from such process are rendered more suitable for subsequent processes for obtaining the metals from them, and at the same time the act of so treating the ores and the minerals will produce much larger quantities of sulphate of soda than has heretofore been obtained.

The ores should be crushed so as to pass through a sieve of four or more holes to the inch, though this is not always necessary. The salt should be dried previous to mixing with the mundics, or other sulphur ores, either by placing over a flue, so as to obtain the benefit of the otherwise waste heat, or in any other more convenient manner. The object of this drying is to prevent its caking in the furnace. The quantity of sulphur contained in the ore having been ascertained by the analysis of a carefully-prepared sample, a given quantity of salt, say 1 ton, having been weighed out, a quantity of ore containing sulphur, required for the conversion of the salt into salt-cake, should be added, and intimately mixed. The quantity of sulphur required to convert a ton of salt into salt-cake is by calculation about 5 cwt. 1 qr. 11 lbs.; but as all the sulphur cannot, I believe, even with the most careful manipulation, be taken by the salt, it is proper to have the sulphur in excess above that quantity; and although a beneficial working may be obtained by employing a much less quantity of salt in respect of the sulphur contained, yet I have found that in all cases the common salt should considerably exceed the known weight of sulphur contained in the ore or mineral under process; and I do not make any claim to combining



common salt with ores or minerals containing sulphur, where the salt used does not exceed the weight of sulphur contained in a proportion at least of 60 of salt to 40 of sulphur. The mixture of about two-thirds of the ore required for the salt used should be put upon the upper bed of the furnace, that is, the bed furthest removed from the fire, and left until heated throughout. It should then be turned over from time to time, so as to allow of the successive contact of the mixture with the atmospheric air passing through the furnace. At about equal intervals, and frequently during the time the mixture remains on the upper bed, the remaining quantity of ore should be added. By these means the rapidity and effectiveness of the operation is promoted, and some saving of fuel is produced. It is impossible to fix the exact quantity of ore required, as it must vary according to the quantity of sulphur contained in the ore employed, and depending in some degree on the nature of the substances associated with it; but I generally apply a quantity of ore containing at least 5 cwt. 1 qr. 11 lbs. of sulphur to each ton of common salt. The less arsenic contained in the ore the better, although its presence is not an insurmountable objection, especially if associated with a small per-centage of copper. A charge being drawn about every 24 hours from the front bed, each one of the three remaining charges will then be moved forward to the next lower bed, and a fresh charge put into the upper bed, each one of the charges being kept regularly raked in its turn. A brisk fire is to be kept up in the furnace during the whole time, and a damper is applied to the chimney to obtain regulation. As the decomposition of the salt and ore proceeds, the mixture is gradually fitted to bear the increase of temperature obtained by removal from the upper to the next lower bed, and so on, approaching the fire. The operation appears to proceed best when on the bed nearest the fire it has been brought to a semi-pasty condition, or when the mass has a tendency to agglomerate, and seems to be moist on the surface. By the increase of temperature to which it is here exposed, the charge soon begins to dry up, so that it is eventually drawn in a granular condition. The sulphate ash obtained contains sulphate of soda or salt-cake, the chloride of sodium, oxides of iron, a soluble salt of copper, and oxide of tin, if any tin was present in the ore employed, provided the ores be mundic, and if other ores are used other products will be obtained. The ash, being lixiviated with water, affords a solution containing sulphate of soda, chloride of sodium, and salt of copper, the insoluble residue containing the oxides of iron and tin. If oxide of tin be contained in the ore employed, it may be separated from the residual matters by washing, the greater specific gravity of the oxide of tin rendering the separation comparatively easy. The copper may be separated from the solution either with iron, as is well understood, or, as I prefer, by the addition of lime slacked in water, forming a milk of lime. Iron precipitates the copper in a metallic form, but the lime precipitates it as an oxide, associated with the slight excess of lime necessarily employed, and some small portion of sulphate of lime. This precipitate, by filtration



having been separated from the refined liquor, should be well washed, in order to the complete separation of sulphate of soda and chloride of sodium, the liquors obtained being employed in the lixiviation of fresh sulphate ash. This precipitate is bulky, but by filtration and drying its volume is very much diminished, and it is then obtained in a condition fit for reduction to the metallic state by the usual metallurgical process. The solution from which the copper has been separated may, if required, be concentrated by boiling, and set aside to crystallize in suitable vessels, very fine crystals of the sulphate of soda being obtainable. The mother-liquor may be again concentrated and set aside to crystallize, or, if required, be employed for the manufacture of alkali, by mixture with fresh lime, in quantities bearing the proper proportions observed in the manufacture of black ash. If the salt-cake be required only for the manufacture of alkali, the solutions obtained by lixiviation should be run off into a large tank, from which the quantity of liquor, containing the desired quantity of salt-cake, may be run on its equivalent of newly-burnt lime, previously weighed out, by which means the water of solution is either solidified or expelled by the heat evolved in the course of the slacking. But should the solution be so weak that the heat evolved from the requisite quantity of lime would not be sufficient to expel the whole of the water, the lime, after having been treated with sufficient of the liquor for slacking and converting into a thick pasty condition resembling a tough mortar, might be thrown either upon a flue at the end of a black ash furnace, by means of which the benefit of spare heat may be obtained, or upon the third bed of a black ash furnace, where, as evaporation proceeds, the remainder of the liquors required may be gradually added. By these means a more perfect mixture of the salt-cake with its equivalent of lime is obtained, than is the case by the usual process of mixing only the slacked lime and the dry sulphate of soda, or salt-cake in powder. The mixture of sulphate of soda and lime, treated with its requirements of carbonaceous matter, previous to turning down to the lower bed of the black ash furnace, is in the usual condition in which it is employed.—Sealed Oct. 20, 1842.

*Patent granted to William Smith, Grosvenor Street, for Improvements in treating certain Animal Matters, to obtain Products applicable to the Manufacture of Candles and other Purposes.*

The first part of the invention consists in submitting lard to a process of heating and cooling, in order more advantageously to obtain two products therefrom, as hereinafter described.

I take any convenient quantity (say a ton) of lard (preferring the cheaper qualities thereof, such as those imported from America), and subject the same to the action of heat in a large tank, or other suitable vessel, until completely melted, and raised to the temperature of 200° Fahr., or thereabouts, for the purpose of which operation I recommend the use of a tank heated by steam-pipes.



The melted lard is then allowed to cool gradually, either in the same or in any other vessel or vessels; and in cooling it crystallizes or granulates, and thereby becomes better fitted for being operated upon by pressure, as hereinafter mentioned. And it is desirable to remark, that, in order to give sufficient time for the crystals to develop themselves fully, the vessels should be protected from draughts of air.

If the lard operated upon is rancid and impure, I purify it by any suitable means before submitting it to the above-mentioned process of crystallization; and the process I prefer for such purpose of purification is, boiling the lard with diluted sulphuric acid, in vessels into which free steam is admitted through a copper worm, the whole of which process of purification is well known in refining other fats and oils.

The quantity of sulphuric acid will vary considerably, depending on the degree of impurity of the lard, as is the case when operating on other fats and oils; and it is proper to remark, that the acid employed for thus purifying the lard should be carefully removed, or be neutralized by one of the usual alkaline agents. It is also proper, though obvious, to remark, that if the lard be melted for the purpose of purification, it may not be always necessary to melt it a second time for the purpose of crystallization.

After the above-mentioned process or processes, I press the lard so operated upon until its oleine, or the greater part thereof, has been separated from its stearine. This process of pressure may be effected with an hydraulic or other suitable press, the lard being inclosed or placed for the purpose in or between canvas or other proper bags, wrappers, or mats, in a manner similar to what has long been applied to pressing sperm and other fatty substances; but such operation of pressing being well known, it will not require further description, other than to observe, that I prefer to press at or about a temperature of 60° of Fahrenheit. By these means two products will be obtained, which I call "oleine," or the more liquid matter, and "stearine," or the more solid matter.

The oleine resulting from the above processes may be rendered more free from stearine by being again pressed or bagged at a lower temperature, which process can, if necessary, be repeated. The oleine will then, to a certain extent, be applicable to the purposes of burning, wool-combing, lubricating machinery, and the like. Or a further product may be obtained applicable to similar purposes by combining the oleine with sperm oil. To effect this I combine about one part by weight of highly bagged sperm oil with two parts by weight of the oleine. I do not however confine myself to the precise proportion of sperm oil, as the same should be increased or diminished according as the oleine has been expressed, and as the sperm oil has been bagged, at a higher or lower temperature. The proportion of one-third sperm oil and two-thirds oleine is proper when they have respectively been bagged or pressed at a temperature of about 40° Fahr. Care should be taken thoroughly to incorporate the two oils, which I effect by mixing them at about the



heat of  $110^{\circ}$  Fahr., and running them through the bag together; but, provided the mixture be perfectly effected, any other process of mixing may be employed.

Another product of oils, possessing somewhat similar properties, may be obtained by mixing the oleine of lard with olive oil in lieu of sperm oil, as above described. The proportions which I employ are about the same, and should be varied in the same manner and under the same circumstances as above directed when sperm oil is used. The last-described product of oils is adapted for dressing wool and other like purposes; but for lubricating machinery I prefer the first-described product of the oleine and sperm oil.

It is obvious that the oleine of lard used for obtaining these products may, if requisite, be purified after separation from its stearine, but I prefer purifying the crude lard in the first instance.

Another product of oils, possessing somewhat similar properties, may be obtained by combining the oleine expressed from tallow (which oleine is a well-known article) with sperm oil; but to obtain this product, I recommend a rather larger proportion of sperm oil to be employed than above directed in the case of the oleine of lard.

It is obvious that another product of oils may be obtained by combining the oleine of tallow with olive oil, and also that various other products of oils may be obtained by combining the oleines of lard and tallow with sperm and olive oils; but I believe the three first described are practically the best.

I treat the more solid substance resulting from the above processes, which may if requisite be repeatedly pressed at successively higher temperatures, to extract the last-remaining portions of the oleine, and which I call the stearine of lard, in the following manner:—I convert it into fatty acids by saponifying it with lime or a suitable alkali, and by decomposing with sulphuric acid, or other proper acid, the soap so formed, and pressing the compound of stearic and oleic acids so obtained; which processes being well known and in common use as applied to tallow, need not be described. And I would have it understood, that with reference to this last-described part of my invention, I do not confine myself to the use of the stearine of lard as above obtained; for lard deprived of its oleine, or part thereof, by any other means, may be employed.

And I treat the stearic acid so obtained, by purifying the same in the manner in which the stearic acid of tallow is purified, after which it may be applied to the manufacture of candles.

Or I obtain a product of this stearic acid of lard and the stearine of lard by melting and combining them together in about equal proportions; but these proportions may be varied, and the products so obtained may be applied to the manufacture of candles.

Other products, applicable to the manufacture of candles, may also be obtained by melting and combining this stearic acid of lard in any proportions with all, any, or either of the following animal and vegetable matters: tallow, the stearine of tallow, the stearic acid of tallow, wax and spermaceti, cocoa-nut stearine, or cocoa-nut oil, stearine and vegetable wax.—Sealed Sept. 29, 1842.



# THE CHEMICAL GAZETTE.

No. XX.—August 15, 1843.

## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*Observations on Glycerine.* By JACOB BERZELIUS.

WHEN Chevreul discovered the important fact that the fat oils were combinations of an organic base with the so-called fat acids, he also pointed out the analogy existing between them and the compound æthers. He looked upon Scheele's *principium dulce oleorum* as the base, investigated its properties, gave a tolerably accurate analysis of it, and called it glycerine; that this base, once separated from the acids, could no more be made to combine with them, attracted little attention, as the same case occurs with æther.

Chevreul's analysis corresponds very nearly to the formula  $C^3 H^4 O^3$ . Lecanu suspected that it should be expressed by  $C^3 H^3 O^2 + HO$ . He succeeded in isolating stearine from mutton-suet, analysed it, and thought he had shown that it was composed of 1 atom of stearic acid and 1 atom  $C^3 H^3 O^2$ .

Pelouze subsequently submitted glycerine to a more accurate examination. His very careful analyses agree perfectly with the formula  $C^3 H^4 O^3$ . He found moreover that glycerine might be combined with sulphuric acid to form a conjugated acid, of which he analysed the lime salt. This was composed according to the formula  $CaO, SO^3 + C^6 H^7 O^5 SO^3$ , whence it followed that free glycerine is  $C^6 H^7 O^5 + HO$ , and that in the sulpho-glycerate the  $HO$  has been exchanged for  $SO^3$ . As far as we are able to conclude at present from experience, water never enters as water in the constitution of the conjugated acids;  $C^6 H^7 O^5$  can therefore not be regarded as  $C^6 H^4 O^2 + 3HO$ . Pelouze, in conjunction with Liebig, subsequently endeavoured to show, from an analysis of stearine, that glycerine is contained in the fat oils as  $C^6 H^7 O^5$ . Their analyses seem to agree with the following composition:—

2 atoms stearic acid ..	=	140 C + 134 H + 10 O
1 atom glycerine.....	=	6 C + 7 H + 5 O
2 atoms water .....	=	2 H + 2 O
1 atom stearine .....	=	146 C + 143 H + 2 O

Recently several fats have been investigated in the laboratory of Professor Liebig, the results of which are most probably correct, but they do not agree with the above view.



Stenhouse analysed palmatine, and asserted that the glycerine must be composed of  $C^3 H^2 O$ , because this formula agreed with his analyses of palmatine, because it is simple and indicates its affinity to the oxides of æthyle and methyle, and because the decomposition of glycerine by manganese and sulphuric acid into carbonic and formic acids is more readily explained by it. This mode of rejecting the beautiful experiments of Pelouze with one scratch of the pen may justly be termed somewhat inconsiderate.

Since then two other fats have been examined, lauro-stearine by Marsson, and the fat from *Cocculus Indicus* by Francis. They prove that the fat acids contained in them are in combination with a body the composition of which must be  $C^3 H^2 O$ , and which these chemists, following the example of Mr. Stenhouse, likewise consider to be glycerine.

The coincidence of their analyses appears to prove that the base in the fats and oils does really consist of  $C^3 H^2 O$ ; but it is not right to regard it as glycerine in opposition to experiments which deserve the greatest confidence, as it is evidently probable that, like the base in the compound æthers, it may have become converted on being set free in the presence of water into glycerine, which actually appears to be the case.

The above analysis of mutton-stearine is no longer a proof to the contrary, since Redtenbacher has proved that stearic acid has a different composition to that then adopted. Redtenbacher's analysis gives as formula for this acid  $C^{68} H^{66} O^5$ . The excess of hydrogen obtained in his analyses disappears on calculating the atom of carbon according to the more correct number. The probable composition of stearine is that 2 atoms of  $C^3 H^2 O$  are combined with 1 atom of stearic acid. If we admit that in Liebig and Pelouze's, and also in Lecanu's analyses, of stearine, the entire amount of carbon was not burnt, which frequently happens when oxide of copper is employed for the analysis of bodies containing much carbon, then their analyses agree very well with such a view, as the following composition, calculated according to  $C = 75.12$ , will show:—

	Liebig and Pelouze.	Lecanu.	Atoms.	Calculated.
Carbon.....	76.522	76.884	74	77.648
Hydrogen ..	12.328	12.387	70	12.564
Oxygen ....	11.150	10.929	7	9.788
1 atom stearic acid .....	= 68 C + 66 H + 5 O			
2 atoms $C^3 H^2 O$ .....	= 6 C + 4 H + 2 O			
1 atom stearine .....	= 74 C + 70 H + 7 O			

If 1 atom of  $C^3 H^2 O$  is substituted for 1 atom HO, it causes so small a change in the results calculated for 100 parts, that I doubt whether the analyses will ever be so accurate as to admit of our deciding between the two views. The first is certainly the most probable. But if this view is correct, then the base in the fat oils must receive a distinct name. I propose to call the radical  $C^3 H^2$ , *Lipyle*, from *λίπος* fat; and its oxide,  $C^3 H^2 O$ , *oxide of lipyle*.



From what has been stated above, it results that the oxide of lipyle, when it is separated from the fat acids, enters into a new combination with the elements of water, and so forms glycerine. This change of the oxide of lipyle is however not perfectly analogous to the conversion of the oxide of æthyle into alcohol, for 2 atoms of oxide of lipyle combine with the elements of 3 atoms of water to form 1 atom of glycerine =  $C^6H^7O^5$ , which then combines with 1 atom of water to form a hydrate. It is therefore no longer surprising that no one has yet succeeded in combining glycerine with acids\* to form salts, or of obtaining the oxide of lipyle with other acids than those of the fats.—*Archiv der Pharm.* for June.

*On some Reactions of the Salicylate of Methyle.* By A. CAHOURS.

In a former article I have proved the identity of the oil of *Gaultheria procumbens* with the salicylate of the oxide of methyle† both by analysis and synthesis; at present I intend describing some results which I have obtained from the action of ammonia on this oil, and likewise of the anhydrous bases in excess under the influence of a temperature of from 660° to 680° Fahr.

When a volume of the salicylate of the oxide of methyle and from 5 to 6 volumes of a saturated aqueous solution of ammonia are placed in a corked flask, the oil is gradually seen to disappear, and in the space of some days the solution is perfect. The liquid then possesses a brownish-yellow colour; on evaporating it at a gentle heat to within half of its former volume, a substance in long acicular crystals is obtained. Evaporation to dryness affords a brownish crystalline residue, which, submitted to distillation, at first disengages ammoniacal vapours, but very soon afterwards a liquid, which condenses on the cold sides of the retort to a crystalline mass of a sulphur-yellow colour. Redissolved in æther, this substance is deposited on the evaporation of the solvent in the form of yellowish-white laminæ which are possessed of great lustre. They melt at a temperature beneath 212° to a liquid, which on cooling solidifies to a crystalline mass.

This substance, purified by repeated crystallization, is slightly soluble in cold water, much more so in boiling water, from which it is deposited on cooling in the form of long acicular crystals. It is still more soluble in alcohol and in æther. It reddens strongly tincture of litmus, has a peculiar aromatic odour which resembles somewhat that of aniseed, it volatilizes when cautiously heated without undergoing any sensible decomposition. The composition of this product is extremely simple, and is very easily deduced from that of the salicylate of the oxide of methyle, as will be evident from the following analyses. It was found to be composed in 100 parts of—

\* It will be seen, from a paper contained in our last Number, p. 507, that MM. Pelouze and Gelis have succeeded in effecting this in the case of butyric acid. They state however that the number of atoms of water which glycerine loses on entering into combination is as yet undetermined.—*Ed. Chem. Gaz.*

† See this Journal, p. 365.



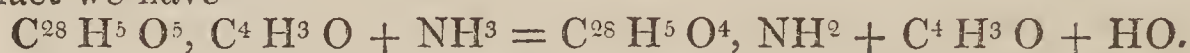
	I.	II.	III.	IV.	Mean.
Carbon . . . . .	60·86	....	61·25	....	61·06
Hydrogen . . . . .	5·28	....	5·30	....	5·29
Nitrogen . . . . .	....	9·95	....	10·09	10·02
Oxygen . . . . .	....	....	....	....	23·63

numbers which agree with the formula  $C^{28}H^7NO^4$ .

It is evident therefore that this product, identical in its composition with anthranilic acid, obtained by M. Fritzsche by acting with potash on indigo, is nothing less than *salicylamide*. This substance indeed regenerates, under the influence of bases or strong acids employed in excess, ammonia and salicylic acid.

Here we have an acid amide produced by the action of ammonia on a volatile monobasic acid containing 6 atoms of oxygen, a fact which is entirely new to science. This class of acids, which I have of late studied with great care, presents some very singular results.

The above reaction is explained in a very simple manner. In fact we have



The action of anhydrous barytes and lime on the salicylate of methyle is very interesting. If some salicylate is let fall drop by drop on to some finely pulverized caustic barytes, a very considerable elevation of temperature is perceptible, and a well-defined crystalline compound is formed. If the barytes is in great excess, and the mixture be submitted to dry distillation, an oily matter passes over into the recipient, the greater portion of which does not dissolve in potash. This substance, purified by several washings with alkaline water and dried over fused chloride of calcium, offers precisely the composition of anisole, the formation of which in the distillation of crystallized anisic acid in presence of excess of barytes I have already described. This product was found to be composed in 100 parts of—

	I.	II.	Atoms.	Calculated.
Carbon . . . . .	77·56	77·59	28	77·77
Hydrogen . . . . .	7·62	7·56	8	7·40
Oxygen . . . . .	14·82	14·85	2	14·83

Moreover, the action of bromine, of nitric and sulphuric acids on this substance is identical with that which these reagents exert on anisole.

We thus see two isomeric substances, anisic acid and the salicylate of methyle, presenting moreover the same chemical equivalent, furnish under the influence of hydrated bases entirely different products, while in the presence of the very same bases in their anhydrous state they afford one identical substance. It would be curious to investigate the products which formobenzoilic acid would furnish under similar circumstances, as it likewise presents a complete isomerism with the preceding compound.

Is it not remarkable to find a body offering the composition of the neutral æthers behave like a true acid? It appears that in the preceding reaction the hydrate of phenyle and the oxide of methyle combine in *statu nascenti* to form anisole. The production of this compound under this circumstance ought not to be an isolated fact,



for the æthers of acids with 6 atoms of oxygen possess the properties of acids, and would without doubt afford similar results.

I will take advantage of this occasion to mention a curious reaction of anisole. I was induced to believe that this body, from its composition,  $C^{28}H^5O^{26}$ , might be regarded as the alcohol of the benzoic series. To solve this question I distilled anisole several times over anhydrous phosphoric acid; but instead of obtaining the carburetted hydrogen,  $C^{28}H^4$ , as I expected, I found the anisole to pass over without undergoing any alteration. This result appears to me to be of importance in the discussion of the theories relating to the constitution of the alcohols.

Two hypotheses have been advanced relative to these compounds; the one by M. Dumas consists in considering them as formed of a carburetted hydrogen and of water; the action of sulphuric and phosphoric acids on these bodies would then be limited to the separation of this water. According to other chemists, on the contrary, the water does not pre-exist in them, and the action of the above acids would be to determine the formation of this water by their affinity for it.

If now we consider that anisole, which seems to be related to the alcohols, does not undergo any alteration from the action of phosphoric acid, may we not be allowed to draw this conclusion, that in the alcohols, properly so called, the oxygen and hydrogen which separate in the state of water exist in this form, and that it is not solely the affinity of the acid for the water which determines the separation?

In conclusion, I may mention that salicylic æther forms crystalline combinations with bases, and that it affords with chlorine, bromine and nitric acid, compounds which resemble in every respect those derived from the salicylate of methyle.—*Comptes Rendus*, July 3, 1843.

*On the Important Part which Fat plays in the Process of Assimilation and in the Lactic Fermentation. By C. G. LEHMANN.*

The author thinks it likely that fatty substances will yet be admitted as among the most important agents in the entire series of animal metamorphoses, assimilation, &c., and that the more immediate manifestations of vitality in the animal organism take place under the concurring actions of proteine compounds, fat and certain non-azotized substances. In his 'Elements of Chemical Philosophy,' the author hinted at the important connexion which he conceived to exist between the secretion of the liver and fatty matters; but he had not then, as he has now, demonstrated by chemical and physiological inquiries the conversion of fat into bile.

Before proceeding to investigate the chemical changes which fat undergoes in digestion, chylication, &c., he inquires whether alterations may not be effected out of the body analogous to those which it experiences within it? With this view he exposed a mixture of a proteine compound, a fat and a saccharine, or amylaceous principle,



to a temperature of 100° Fahrenheit. The proteine compound employed was white of egg dried at a temperature of 122°, and then of 212° Fahr., and reduced to fine powder. Prepared in this way the albumen remained perfectly soluble in water. The fatty substance was the oil of the yolk of egg. The unazotized article was sugar of milk. To effect the more perfect solution of the albumen a little carbonate of soda was added. A certain quantity of these substances being mixed together, and placed in the proper temperature, lactic acid was speedily produced; whenever this was found present in such quantity as distinctly to redden litmus paper, the acid was neutralized by the addition of a solution of carbonate of soda of known strength, so that the production of lactic acid could be followed exactly. When there was no longer any production of acid, or otherwise, when the sugar of milk had been all converted into lactic acid, a further quantity of the sugar was added, until there was again cessation of the acidifying process, not however through any want of sugar to be acted on, but through failure of one of the other ingredients in the mixture, whether oil or albumen.

28th September, 0·340 gr. albumen (= proteine), 0·756 gr. yolk-oil, and 1·145 gr. sugar of milk, were added to 5·069 of a solution of carbonate of soda (which in 100 parts contained 7·439 parts of dry carbonate of soda) and a sufficient quantity of water, and placed in the brood-machine. October 2nd, the mixture was neutral; 3rd, it showed distinct acid reaction, and had therefore some more of the soda solution added. October 5th, acid reaction again; and as this did not increase on the 7th, 8th, 9th, some more sugar of milk was added. October 10th, the acid reaction being very powerful, a fresh addition of the soda solution was made. This was repeated the 11th, 14th and 17th, after which the reaction continuing alkaline, another portion of the sugar was supplied on the 24th; 26th, acid reaction again; but this did not increase in spite of the addition of more sugar. On the whole, it was found that by means of the quantities of albumen and of oil mentioned, 3·468 grs. of sugar of milk had been converted into lactic acid. On the 5th November, 0·270 gr. of yolk-oil was added to the mixture, and the acidification began again anew, so that on the 6th and 8th soda solution had to be added, and on the 9th another portion of the sugar; on the 12th an addition of the soda solution was made; on the 15th the same, after which the fluid remained alkaline. The production of acid began again however upon the addition of some more yolk-oil on the 21st November, and this went on till the 2nd December, after which, although additional portions both of yolk-oil and of milk-sugar were supplied, no further production of lactic acid took place. The products of the fermentation thus conducted were these:—The proteine compound appeared to suffer no change, no diminution in quantity or otherwise; no yeast-globules, or mould, or other low form of organization, appeared to be developed; coagulated albumen was brought back in its course to the soluble state; fibrine was changed into albumen. The fat or oil was turned in major part into one of the fat acids,—butyric or sebacic acid; the



phosphoric fats lost their phosphorus. Starch and sugar are generally converted into lactic acid, but sometimes also into two other acids. No evolution of gas is necessarily observed; sometimes a little carburetted hydrogen was procured, but then the fermentation was not well conducted, and at the same time infusoriæ were found in the fluid.—*Berträge zur Physiolog. und Patholog. Chemie u. Mikrosk. Herausges. von Fr. Simon Berl.* 1843; and *Lond. and Edinb. Month. Journ. of Med. Science* for August 1843.

*On some Salts of Solanine.* By M. BAUMANN.

The following new salts of solanine were prepared by the author by dissolving the acid in water, heating the solution, and adding solanine as long as any was dissolved. The clear filtered solution was then slowly evaporated at a gentle heat.

*Crystalline Salts.*

*Mucate of Solanine* crystallizes very beautifully in tufts of white needles, which appear under the microscope to be rhombic prisms. The salt is easily soluble in cold water, and the solution acts perfectly neutral towards curcuma and litmus paper. Caustic ammonia colours the solution faintly brown and precipitates the solanine. Solution of iodine becomes immediately coloured dark brown. Nitrate of silver affords a precipitate of mucate of silver in the form of a white powder, which by exposure to the light becomes violet, and subsequently black.

*Tannate of Solanine.*—The hot clear solution becomes turbid on cooling from the separation of the tannate of solanine, but on warming redissolves to a perfectly clear solution. The salt crystallizes in tufts of yellow needles; it dissolves with difficulty in cold, easily and entirely in hot water. The solution reddens litmus paper, and becomes greenish by exposure to the atmosphere. Caustic ammonia colours the liquid red, with separation of solanine and formation of humate of ammonia. Solution of iodine is decolorized, but the brown colour immediately appears on the addition of some caustic ammonia. Sulphate of iron colours the liquid immediately blackish-blue.

*Succinate of Solanine.*—Colourless, transparent, acicular needles, superposed one on the other, resembling beautifully crystallized pyrolusite, easily soluble in cold water. The solution reddens litmus paper. Caustic ammonia separates the solanine. Acetate of lead affords a white precipitate of succinate of lead *entirely* soluble in an excess of the precipitant.

*Non-crystalline Salts.*

*Formate of Solanine* is a gummy, amorphous, transparent mass. It is dissolved with difficulty in cold water, and is decomposed into an acid and a basic salt. The liquid filtered from the insoluble portion has an acid reaction. Caustic ammonia separates the solanine; nitrate of silver is quickly reduced.



*Benzoate of Solanine*.—An amorphous mass, scarcely soluble in water, being likewise decomposed into an acid and a basic salt; the liquid filtered from the latter has an acid reaction. Ammonia separates the solanine. On heating the salt cautiously, the succinic acid is easily detected by the smell. The salt could not be obtained from an alcoholic solution.

*Prussiate of Solanine*.—An amorphous, transparent, gummy mass. The salt dissolves with difficulty in water, and is likewise decomposed into an acid and a basic salt; caustic ammonia separates the solanine; nitrate of silver gives a white precipitate, which becomes violet by exposure to the light.

*Gallate of Solanine*.—An amorphous mass, which is easily soluble in water; the solution has an acid reaction. Ammonia imparts a brown colour to the liquid, arising from the production of humate of ammonia, and at the same time solanine is deposited. Solution of iodine likewise indicated the presence of solanine. Sulphate of iron immediately coloured the solution blackish-blue.

*Tartrate of Solanine* is an amorphous gummy mass, which is scarcely soluble in water; the solution has an acid reaction. Ammonia separates the solanine; acetate of lead affords a white crystalline precipitate of tartrate of lead, which dissolves entirely in dilute acetic acid.

*Citrate of Solanine* resembles in every respect the preceding salt. Acetate of lead affords a white precipitate of nitrate of lead, insoluble in water, but soluble in dilute acetic acid.

The *Racemate* and *Malate of Solanine* also resemble the above.

The author made three experiments to obtain the nitrate, but without success. Solanine was conveyed into very dilute warm nitric acid as long as any was taken up, and the filtered solution evaporated at a very gentle heat. At a certain degree of concentration the liquid became yellowish, gave off white vapours, which had a strong acid smell and reddened litmus paper; at the same time some drops of a brown oil separated on the surface, which subsequently became yellow. On further evaporation a yellow, transparent, amorphous mass was left, which dissolved easily in water, but in which not a trace of solanine could be detected by any reagent. The same result was obtained on evaporating the solution of the salt, prepared in the cold over sulphuric acid. On attempting to form the salt by double decomposition with nitrate of lead and sulphate of solanine, it was found impossible to obtain the salt free from oxide of lead.—*Arch. der Pharm.*, xxxiv. p. 158.

#### *On Legumine. By Dr. F. ROCHLEDER.*

There exists, in the cotyledons of leguminous plants, a substance containing nitrogen and sulphur, to which its discoverer, Braconnot, applied the name legumine. The similarity of its properties to those of caseine which occurs in the milk of animals, to which Braconnot, in his researches on the latter body, drew attention, induced



Prof. Liebig to call it vegetable caseine. Several analyses of this body, performed in his laboratory, afforded the following results:—

	I.	II.	III.
Carbon.....	54·138	55·05	51·41
Hydrgen .....	7·156	7·59	7·83
Nitrogen .....	15·672	15·89	14·48
Oxygen .....	23·034	21·47	26·28
Sulphur .....			

According to these analyses, the carbon and nitrogen are in the atomic proportion of 8 to 1, thus proving the identity of legumine with caseine.

MM. Dumas and Cahours have likewise published, in a recent memoir “On the neutral nitrogenous substances of the organization,” some experiments made on legumine, its properties and composition, which do not agree with the above analyses and with the properties assigned to legumine by Braconnot and Liebig.

The numbers which must be considered, according to their analyses, as expressing the composition of legumine, are—

Carbon .....	50·9
Hydrogen .....	6·5
Nitrogen .....	18·5
Oxygen .....	24·1 *

These numbers show that legumine contains less carbon and more nitrogen than caseine, that these elements are not in the atomic proportion of 8 to 1, as is the case in caseine. The difference between the properties of legumine, according to the observations of Braconnot and Liebig, and those assigned to it by Dumas and Cahours, will appear most distinctly by placing their statements in juxtaposition.

Legumine, according to Liebig, is soluble in cold water; the solution does not coagulate by heat. On evaporation over the fire a skin forms on the surface of the liquid, which is renewed as often as it is removed.

According to Dumas and Cahours, cold water dissolves a considerable quantity of legumine, and when the liquid is raised to a temperature near boiling, it coagulates and deposits coherent flakes, which resemble in appearance coagulated albumen.

Again, Liebig states that the solution of legumine in cold water is instantly rendered thick by the addition of acetic acid, forming a pulpy mass of fine flakes, which do not dissolve in an excess of the acid.

Dumas and Cahours say, that when dilute acetic acid is added to a solution of legumine it is immediately precipitated; that an excess of acid dissolves the precipitate, and the solution becomes instantly perfectly clear.

These contradictions would have been very difficult to explain had not Dumas and Cahours, by the words with which they conclude their description of the properties of legumine, “all the pre-

\* According to this, legumine would contain no sulphur, of which however a very considerable quantity is found in it.



ceding experiments have been made with legumine from sweet almonds," given the key to the enigma.

Their experiments incontrovertibly show that the body contained in the almonds was no legumine at all. The similarity in composition no more proves the identity of this body with legumine, than it would justify us in asserting albumine and fibrine to be one and the same substance.

Dr. Rochleder finds, after repeated examination of the legumine from leguminous fruit, that it exists in them contaminated by another body, which may be separated by potash and ammonia; and that, after the removal of this substance, all the analyses of legumine agree in showing the uniformity of its composition.

Legumine was first prepared from beans, by treating them with warm water, removing the skins, washing them repeatedly with warm water until this no longer acquired a greenish-yellow colour, then leaving them to stand covered with warm water until they became soft. The pulpy mass obtained by pounding them was well stirred with water, to which a few drops of ammonia had been added, in order to prevent any legumine being precipitated by the lactic acid which might be formed. The pulpy mass, mixed with the water, was thrown on to a sieve, the liquid which passed left in quiet in a closed vessel, and after the whole of the starch had subsided, the supernatant liquid removed by means of a siphon. On the addition of acetic acid, a large quantity of legumine was thrown down in flakes, having a nacreous lustre. This precipitate was washed with cold water as long as any foreign substance was removed by it. For the purpose of edulcoration it is advantageous to employ vessels with a large aperture, which may be closed in order to prevent access of air, and any change which it might induce. The substance, treated in this manner with water, was now boiled with alcohol, and then with æther, as long as these left any residue on evaporation. The white legumine, thus purified, assumes on drying a dark gray tint, which, on reducing the substance to powder, again disappears for the greater part. The pulverized legumine, dried at  $266^{\circ}$  Fahr., forms a white powder with a faint grayish tint.

Legumine was prepared from two different kinds of beans, and purified as above described. On analysis with chromate of lead, and for the nitrogen, according to Varrentrapp and Will's method, the following results were obtained:—

	I.	II.
Carbon .....	52.99	51.15
Hydrogen .....	6.99	6.49
Nitrogen.....	14.81	14.01
Oxygen .....	} 25.21	28.35
Sulphur .....		
	<hr/> 100.00	<hr/> 100.00

Amount of ash in I., 2.20; in II., 1.63.

Although the atomic relation between the carbon and nitrogen is the same in both analyses, it is not so with respect to the absolute



quantity of the carbon, hydrogen and nitrogen, and the analyses show that the difference is not caused by the amount of ash.

These differences are however easily explained by admitting that another body of similar composition contaminates the legumine, sometimes to a large, sometimes only to a small extent.

The legumine employed in the following experiments was obtained from peas, which afford larger quantities of it than beans. It was prepared quite in the same manner as above described.

After the legumine has been washed with water, a concentrated solution of caustic potash was poured over it, avoiding heat, in which the legumine easily dissolves. The solution thus obtained is however not clear, but turbid and opaque, caused by a body suspended in it. Left for some moments in quiet, the solution clarifies, the above-mentioned body collects into voluminous flakes and subsides. The clear supernatant liquid is removed from the precipitate with a siphon, and filtered in order to obtain it perfectly clear. Several filters should be employed, as it passes very slowly, and might easily suffer some alteration by too long exposure to the atmosphere. Acetic acid in excess is added to the clear solution, and causes a flocculent precipitate of legumine, which is washed with water as long as this removes any acetic acid or acetate of potash. To further purify the legumine it is now treated with solution of ammonia, in which it dissolves to a turbid liquid, which is obtained clear by filtration. The clear solution of legumine in ammonia is precipitated with acetic acid, and the acetate of ammonia removed by edulcoration. Thus purified, it is treated so long with alcohol and æther as these remove any substance from it.

Legumine, prepared in this manner, was dried in an oil-bath at 266° Fahr., and employed for the following analyses. It contained 7.118 per cent. ash.

	I.	II.	III.	IV.	V.	VI.	Mean.
Carbon . . . .	54.41	54.73	54.33 . . . . .				54.49
Hydrogen ..	7.54	7.35	7.31 . . . . .				7.40
Nitrogen . . . . .				14.67	14.60	15.00	14.78
Oxygen }							23.33
Sulphur }							
							<hr/> 100.00

These analyses give 3 per cent. more carbon, and as much nitrogen less, than those of Dumas and Cahours, and exhibit a perfect coincidence with the numbers obtained in the analysis of caseine.

The legumine, purified in the above manner, with which these analyses were made, differs in several properties from the impure. Pure legumine does not assume on drying a green colour, but a yellow one, and may be easily reduced to a white powder, which after desiccation is slightly yellowish. It does not swell up on being heated, but agrees with it in being easily soluble in potash, soda and ammonia, but without any residue, resembling in this respect caseine, from which it differs by its insolubility in excess of acetic acid.

The solution of pure legumine in potash changes when exposed to the atmosphere for some length of time, for instance eight or ten



days. White flakes separate from the solution, and at the same time ammonia is liberated. When legumine is boiled with solution of potash, the disengagement of ammonia does not begin before the solution has become so concentrated that it solidifies on cooling. The ammonia which is given off has a smell similar to that which is liberated when gall is boiled with potash. When it is boiled for a length of time with moderately concentrated solution of potash, returning from time to time the evaporated water, some blackish flakes separate, and a brownish solution is formed, which on the addition of acetic acid lets fall a body in gray flakes, and which dissolve in an excess of the acid, properties which would seem to indicate the presence of proteine. Boiled with nitric acid, legumine dissolves with disengagement of nitrous acid vapours to a yellow liquid, which becomes red on the addition of potash or ammonia; it seems therefore that xanthoproteinic acid has formed.

Legumine precipitated by acids has, even when entirely free from the acid, a faintly acid reaction on litmus paper.

The body which remains, in the treatment of the crude legumine with solution of potash, forms, after edulcoration with water, boiling with alcohol and æther, a brownish-gray powder, which on combustion smells like burnt horn and bread, without swelling up, and leaves a considerable residue of ash.—*Liebig's Annalen* for May 1843.

#### *Death from Prussic Acid.*

Death caused by prussic acid, says a German paper, is only apparent; life is immediately restored by pouring acetate of potash and common salt, dissolved in water, on the head and spine. Some time since, Mr. Rogerson, a chemist, instituted a series of experiments on animals for the purpose of observing the effects of prussic acid, and of discovering the means to be pursued in case of poisoning by that fluid. He then, if we mistake not, invited the attention of the medical profession to the fact, that rabbits poisoned with prussic acid could be at once recovered from apparent death by merely pouring cold water over the head and spine.—*Morning Chronicle*.

#### *Discovery of another new Metal.*

In a former Number of this Journal we had occasion to announce the discovery of the fifty-sixth element, didymium, by M. Mosander. We now learn that the same chemist has discovered another new metal, which accompanies cerium, lanthanum and didymium, and to which it bears great resemblance, in the mineral gadolinite.

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## ANALYTICAL CHEMISTRY.

*On the Blowpipe.* By THEO. F. MOSS, *Mining Engineer.*

THE importance of the blowpipe in analytical research is daily advancing with the progress of chemistry. The knowledge of its



use is of the utmost importance to the mineralogist, for with the assistance of a few simple reagents he is enabled to determine in a few minutes most of the ingredients of a mineral, which by the usual process of analytical examination in the wet way would require hours, and often days. When travelling he is often compelled to let his curiosity rest satisfied concerning the nature of minerals which he may find till he returns to his laboratory; whereas with a knowledge of the use of the blowpipe he would carry with him the means of determining the component parts of minerals on the spot, and of ascertaining the presence of substances, which, if contained in small quantities, would be detected only by the most accurate analysis. An examination before the blowpipe is to be considered as preparatory to a quantitative analysis by the moist way.

It is not however meant that the blowpipe is infallible in detecting all the substances of a compound, for one of its components may have such a strong reaction as to conceal the reaction of many others; nor is the following meant as a complete treatise on the blowpipe, but merely to give an insight into its importance and some of its easier applications, which it is hoped may be of service to the mineralogist in his summer excursions through our interesting country, and perhaps aid in adding the knowledge of the blowpipe to his other acquirements.

Supposing the reader to be acquainted with the form and manipulations of the blowpipe, I will proceed to describe the order of examination of a substance before the blowpipe, and its different reactions.

The quantity of mineral which serves for examination need be but small; for many operations a splinter the size of a millet-seed will suffice, and for some even a much smaller quantity is more than sufficient; another advantage which the blowpipe possesses, especially if we have to deal with valuable and rare specimens.

The first operation is to place a small portion of the substance in a thin glass tube closed at one end, then to heat it over a spirit-lamp, and afterwards by the blowpipe-flame. The object of this operation is to determine what volatile substance the mineral may contain, and sometimes to prepare it for succeeding operations. One of the volatile substances most commonly met with is water, either hygroscopic or chemically combined. The state in which it exists is easily determined by examining the deposit at the cool end of the tube, and ascertaining whether it has an alkaline or acid reaction. An acid reaction of the water results from the decomposition of acid salts, seldom from the decomposition of neutral salts, and then usually from the nitrates, which fill the glass tube with the vapours of nitrous acid, and from the sulphates when sulphurous acid is disengaged, which may be known by the smell.

Fluoric acid is also driven out of some of its compounds when water is present, and this is easily recognized by its pungent smell and by its destroying the lustre of glass. Besides water, many substances, when heated in a glass tube closed at one end, are volatilized and deposited on the cooler parts of the tube; these subli-



mates are distinguished from one another by their colour, fusibility and volatility.

A sublimate of red-brown globules, which on cooling become yellow, denote sulphur. A reddish sublimate, or one which in large quantities is black, and which on being rubbed has a dark red appearance, shows the presence of selenium. This burns in contact with the air, with a blue flame, spreading a very characteristic smell like decayed horse-radish.

Arsenic sublimes also when the substance contains metallic arsenic or any of the arseniurets, and also some of the arseniates, and is easily known from the vapours having a smell like garlic.

Quicksilver is easily known, and forms a gray sublimate, which on being moved forms into small globules of metallic quicksilver.

Heat sublimes cadmium from most of its compounds, and the sublimate, when heated in contact with the air, is changed into a yellowish-brown vapour of oxide of cadmium.

Tellurium sublimes at a strong red heat, and deposits on the cool end of the glass tube in metallic globules.

The oxide of antimony sublimes in shining needles, melting first into a yellow fluid.

The oxide of tellurium has a similar action, but is not so easily volatilized, and does not sublime in crystals.

Arsenious acid sublimes very easily.

Arsenic acid is changed by a high heat into arsenious acid, and gives the same sublimate.

Osmic acid sublimes in white drops and crystalline needles, and disengages a very characteristic smell, which attacks the eyes and nose in a very unpleasant manner.

The chloride of mercury gives a yellow sublimate, which on cooling is grayish-white.

After having examined the mineral in a glass tube closed at one end, the next operation is to heat another portion of the substance in a tube open at both ends, the object of which is to see if volatile substances are disengaged by contact with the air; by inclining the tube more or less from a horizontal position, we have it in our power to increase or diminish the access of air. The substances which are thus disengaged escape either as gases, or are sublimed in the cooler end of the glass tube.

Sulphurous acid is one of the substances which escapes in this manner in the gaseous form. The smallest quantity of this, which may be easily detected if, when heating, the tube be held nearly horizontal, and then immediately brought in as near a perpendicular position without letting the substance drop out, and held with its upper end to the nose, when the sulphurous acid is easily detected by its pungent smell.

Combinations of selenium, tested in like manner, give a red sublimate and the peculiar smell of selenium.

Combinations of tellurium give a gray or grayish-white sublimate, which melts into clear transparent globules.

Combinations of arsenic give, when heated in the glass tube open



at both ends, a similar sublimate to the combinations of arsenious acid when heated in the tube closed at one end.

The sulphuret of bismuth and the metallic combinations of bismuth give a sublimate of oxide of bismuth, which by heating melts into yellowish-brown drops. Minerals containing a small quantity of bismuth give a sublimate which is surrounded by dark yellowish sublimate of bismuth, and becomes paler on heating.

Lead has a similar action, but the sublimate is much lighter.

Sulphuret of lead and seleniuret of lead give a white sublimate, which however melts to a gray colour.

The sulphuret of tin gives a white flaky sublimate.

Molybdic acid, a white powdery sublimate and light yellow shining crystals, which are easily volatilized.—*Journal of the Franklin Institute* for April 1843.

### *Determination of Nitrogen.*

Our readers will learn with pleasure that M. Reiset has made the *amende honorable* to MM. Varrentrapp and Will, for having called in question their method of determining nitrogen in organic compounds. He states, in a note affixed to the French translation of Dr. Will's memoir in the 'Annales de Chimie et de Physique' for June, that he also found, soon after the publication of his paper, that the alkaline mixture employed in his experiments contained some nitrates. It is to be regretted that M. Reiset did not publish his error immediately on detecting it, as it would have saved many chemists a considerable deal of time and trouble.

### *Mode of Analysis in Cases of Poisoning by Copper.*

By MM. DANGER and FLANDIN.

The animal substances are carbonized with a third of their weight of sulphuric acid. The coal is brought to a dark red heat, either in the same capsule in which the combustion had been effected by means of the sulphuric acid, or in a separate porcelain crucible. The charcoal is then reduced to powder, treated with a quantity of sulphuric acid sufficient to moisten it, boiled, then treated with water, in order to try on this liquid (sulphate of copper) the tests necessary to distinguish and characterize this metal. This process is applicable in searching for lead, silver, bismuth, tin, gold, &c. It is scarcely necessary to mention that in the case of lead the ash must be treated with hydrochloric acid, while in that for tin and gold *aqua regia* must be employed. The authors state that by this process they have been able to detect a hundred-thousandth of the metal when mixed with organic substances.

The copper is found after death exclusively in the intestinal canal and in the liver, where it had been carried by absorption. 48 to 60 grms. of the intestine ( $1\frac{1}{2}$  to 2 oz.) suffice to afford legal proof of poisoning.—*Comptes Rendus*, July 24, 1843.



# PHARMACOLOGY.

Comparative Examination of several Kinds of Sarsaparilla. By M. MARQUART.

THE following experiments were made with 250 grs. of each kind :—

	Vera Cruz.	Lisbon.	Honduras.	Lima.	Caraccas.	Jamaica.	Honduras?
Amount of extract by infusion .....	Grains. 25	Grains. 14	Grains. 12	Grains. 36	Grains. 16	Grains. 28	Grains. 26
Colour of the infusion .....	Light brown	{ Reddish brown }	Slightly light brown }	Very red	Light brown	Reddish brown	Reddish brown
Amount of extract which dissolves in rectified spirits of wine .....	23	10	10	26	12	14	18
The residue contains .....	Sulphates	{ Sulphates and albumen }	..... {	Sulphuric, phosphoric acid, & potash	{ Gum }	Potash and sulphuric acid	} Potash
Amount of extract obtained by decoction...	32	26	24	42	22	40	
Colour of the decoction.....	Dark brown	Reddish brown	Light brown	Dark red	Brown	Reddish brown	
Amount of extract which dissolves in alcohol .....	25	16	12	28	12	28	
The residue contains .....	Starch	Starch	Starch	No starch	Starch	No starch	

The alcoholic solutions of all the above-mentioned sarsaparillas had, without exception, an acid reaction. Lime-water produced in none an immediate turbidness, even on standing no precipitate, but on boiling a somewhat voluminous sediment, with the exception of the last and that from Lima, which even on boiling afforded but a very slight precipitate. *Oxalate of ammonia* produced in all no opacity, or but a very slight one, and after 24 hours a small white sediment. *Acetate of lead* produced in all the solutions considerable precipitates (with the exception of the first, which was only rendered very turbid, and after 24 hours presented a considerable sediment). The precipitate was fawn-coloured, in the two last of a chocolate colour. The following tests gave various results :—



<i>Perchloride of Iron.</i>	<i>Perchloride of Mercury.</i>	<i>Sulphuric Acid.</i>	<i>Nitrate of Silver.</i>	<i>Caustic Ammonia.</i>	<i>Gelatine.</i>
Dark colouring. After 24 hours, dark colouring.	Very slight turbidness. After 24 hours, opacity and sediment of light brown colour, which subsides very slowly.	No change. After 24 hours, no change.	A slight turbidness. After 24 hours, gray col., becoming grayish-brown by boiling; on the addition of nitric acid, a yell.-wh. precip. sol. in amm.	No change. After 24 hours, no change.	No change. After 24 hours, no change.
Dark colouring and considerable precip. After 24 hours, a considerable gray sediment.	No turbidness. After 24 hours, opakeness and slight precipitate.	Very faint turbidness. After 24 hours, small precipitate.	Brighter col. and strong precip. After 24 h., consid. yell.-wh. precip. soluble in caustic ammonia, not in nitric acid.	No change. After 24 hours, slight sediment.	As above.
A blackish-brown colouring. After 24 hours, a blackish-brown colour and precipitate.	A slight turbidness. After 24 hours, a heavy sediment attached to the sides of vessel.	No change. After 24 hours, no change.	Considerable precipitate. After 24 hours, a large whitish-gray sediment, soluble in caustic ammonia.	No change. After 24 hours, a very voluminous precipitate.	As above.
Dark brown, nearly black colouring. After 24 hours, blackish-brown colouring and large precipitate.	No turbidness. After 24 hours, a heavy white precipitate.	No change. After 24 hours, considerable voluminous precipitate.	Considerable precipitate. After 24 hours, large white sediment, soluble in ammonia.	No change. After 24 hours, small crystals attached to the sides and bottom of vessel.	A considerable precip. After 24 hours, the precip. had become attached to the sides of vessel.
Blackish-br. colouring and precip. After 24 hours, dark solution and considerable grayish-brown precipitate.	No change. After 24 hours, a white sediment attached to the vessel.	No change. After 24 hours, a slight precipitate.	Considerable precipitate and brownish-yellow colouring. After 24 hours, large dirty-white precipitate, soluble in ammonia.	No change. After 24 hours, no change.	No change.
Blackish-br. colouring and large precip. After 24 hours, considerable gray sediment & blackish-brown colouring.	No change. After 24 hours, a heavy white sediment.	Slight opacity. After 24 hours, considerable reddish-brown precipitate.	Considerable precipitate. After 24 hours, considerable flesh-coloured sediment, soluble in ammonia.	Darker colouring. After 24 hours, dark brown colouring and slight white sediment.	A precipitate. After 24 hours, had become attached to sides of vessel.
Blackish-brown colouring and large precip. After 24 hours, considerable blackish-brown precipitate.	Slight turbidness. After 24 hours, considerable light sediment.	No change. After 24 hours, considerable chestnut-brown precipitate.	Considerable precipitate. After 24 hours, large sediment, soluble in ammonia.	Darker colouring and precipitate. After 24 hours, slight flesh-coloured precipitate.	A precipitate.



## CHEMICAL PREPARATIONS.

*On the Mode of Preparation and Therapeutic Properties of Ergotine.* By M. BONJEAN.

POWDERED ergotized rye is treated with water in a displacement apparatus, and the aqueous solution heated over a water-bath. By the action of the heat this solution sometimes coagulates from the presence of a certain quantity of albumen, sometimes not. In the former case the coagulum is separated by filtration, the liquid evaporated over the water-bath to the consistence of a clear syrup, to which a large excess of alcohol is then added, which precipitates all the gummy substances; the liquid is then placed aside until all the gum has subsided, and the solution has reassumed its transparence and brightness, when it is decanted, and reduced over the water-bath to the consistence of a soft extract. In the second case the aqueous solution is brought immediately to a semi-syrupy state, and then treated as above with alcohol in order to obtain the extract.

By this process a very homogeneous soft extract is obtained of a reddish-brown colour, and of an agreeable odour of roast meat, owing to the presence of ozmazome, and of a slightly piquant and bitter taste, resembling more or less that of spoiled wheat. It forms with water a beautiful red solution, perfectly transparent. 500 grms. of ergot afford from 70 to 80 grms. of extract.

Ergotine is a true specific against hæmorrhage in general. It is well known to what inconveniences the use of ergotized rye in medicine was subject, such indeed that it was talked of banishing for ever from therapeutics this valuable agent, because its good virtues were accompanied with an energetic poison, which it was necessary to guard against. At present, four years of research have enabled me to explain the whole matter; and nothing is now more easy than to separate from the ergot the two principles which it contains, which differ entirely in their mode of action, since the one, the ergotine, acts principally on the arterial membranes, while the other, the oil, exerts its action on the nervous centres.

The immediate effect which it produces in the most violent metrorrhagia will strike every one who shall have tried my ergotine; the most obstinate vomitings of blood give way in very little time to its employment, and relapses generally are rare, especially when the precaution has been taken to continue its employment for a certain time after the cessation of the symptoms. To be convinced moreover that the ergotine is the *obstetrical* principle, it suffices to treat the powder of ergot by æther, in a displacement apparatus, as long as any soluble matter is taken up by this liquid. In this manner the whole of the poison, that is the whole of the oil of ergot and the resin, are removed, and there remains a powder, no longer greasy, but gritty like sand, without bad taste, without any poisonous action, and which excites powerfully the uterine contractions in doses of from 0·4 gr. to 0·5 gr. in all cases of inertia of the matrice, where the employment of ergotized rye is considered advantageous. —*Comptes Rendus*, July 17, 1843.



*Cubic Nitre from Peru.*

According to an analysis of M. Hochstetter, this product consists in 100 parts of 94.291 nitrate of soda, 1.99 chloride of sodium, 1.993 water, 0.239 sulphate of potash, 0.426 nitrate of potash, 0.858 nitrate of magnesia, and 0.203 residue insoluble in water.—*Ann. der Chem. und Pharm.*, xlv. p. 340.

*Anti-rheumatic Counter-irritant Paper of M. Berg.*

Euphorbium .....	30 grammes.
Cantharides .....	15 ...
Alcohol .....	150 ...
Digest for eight days, filter and add	
Colophony .....	60 ...
Turpentine .....	50 ...

Thin paper is coated with three layers of this varnish, which is then employed in the same manner as other counter-irritant plaisters.—*Journ. de Pharm.* for June.

*Rubefacient Pomatum of Croton Oil of M. Caventou.*

Auxungia .....	2½ parts.
Wax .....	½ part.
Croton oil .....	1 part.

Melt the wax at a gentle heat in the lard, allow it to cool, scrape into thin layers, and incorporate in the cold the croton oil.

This pomatum, still weaker, might be employed to support vesicatories.—*Journ. de Pharm.*

*Formulae for the Employment of Nitrate of Silver. By M. BOUTIN.*

*Pills.*—Crystallized nitrate of silver, 2 decigrms.; distilled water, a few drops. Saturate the solution with powdered starch, *q. s.* to make 12 pills, each of which represents one-third of a grain. From 3 to 9 are given daily in chronic gastritis, gaspodynia, and in epilepsy. These pills must be recently prepared, otherwise the nitrate is decomposed.

*Intestinal Injection.*—Nitrate of silver from 5 to 15 centigrms. in 150 grms. of distilled water. Against chronic diarrhœa with slight sensibility of the large intestine, M. Boutin observes that the silver solution acts without doubt by imbibition, always beyond the surface of application. From these observations it results, that it is possible with the intestinal injection in question to act beyond the deocœcal valve, and to modify the ulcerations of the lower portion of the smaller intestines, which in phthisis, and also in typhus fever, frequently complicate the atonic diarrhœa, which it is desirable to remove.

*Vesical Injection.*—Crystallized nitrate of silver, 2 decigrms.; distilled water, 500 grms. This solution, the strength of which may be gradually increased, is employed in the treatment of chronic



catarrh of the bladder, and does not present the inconvenience of applying caustic with the pencil, an operation which has so frequently given rise to mortal cystitis. The sensitiveness of the bladder once ascertained by a first injection, we should be guided in the subsequent injections by the results obtained.

*Pomatum*.—Nitrate of silver, 1 decigram.; auxungia, 4 grms. 1st. In the treatment of ulcerated conjunctiva. 2nd. In leucorrhœa. After having made several vaginal injections, a little ball of lint, greased with this pomade, is placed in the vagina.

In deafness from obstruction or ulceration of the Eustachian tube, some injections are made into the tube, with crystallized nitrate of silver, 5 centigrms. in 200 grms. distilled water.—*Journ. de Pharm.*, June 1843.

### *Citrate of the Protoxide of Iron.*

The citrate of the peroxide of iron was first introduced into medicinal use by M. Beral. Probably the protosalt would be far more effective. M. Oberlin of Strasburg prepares this latter salt by digesting finely-pulverized iron-filings with a concentrated solution of citric acid at about 158° to 176° Fahr. The salt separates from the solution in white crystals.—*Jahrb. für Prakt. Pharm.*, vi. p. 117.

[The protocitrate of iron is comparatively insoluble. The double citrates of the peroxide of iron, now in extensive use, introduced into this country by Mr. Bullock, have the advantage of perfect solubility, and are certainly highly efficacious as chalybeates.—ED.]

### *Syrupus Amygdalarum.*

According to M. Häuseler, a very excellent syrup of almonds, which keeps well, may be obtained by pounding 4 oz. of sweet and 2 oz. of bitter blanched almonds with 6 oz. of sugar until the whole of the oil has separated; the mass is then made into an emulsion with 14 oz. water, and in this 14 oz. of lump-sugar are dissolved.—*Jahrb. für Prakt. Pharm.*, vi. p. 120.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On the Purification of Fish Oil.* By MM. GIRARDIN and PREISSER.

THE constantly increasing price of seed oils (*huiles de graines*) has drawn the attention of speculators to whale oil; and those who first thought of mingling the latter with vegetable oils for purposes of illumination have realized large profits. It is now difficult to find the oils of colza, &c. entirely free from fish oil.

In various scientific and technical works we find processes for the purification of fish oils, which, although simple, are useless, and rather tend to mislead those engaged in their sale or purification.

Thus Mr. Davidson of Edinburgh purifies oil by treating it with



1 per cent. of chloride of lime, diluted with water, under violent agitation, and he assures us that the odour is entirely destroyed; but we obtain only a bleached and thick matter, which is clarified by adding 85 grms. of sulphuric acid, diluted with 16 or 20 times its weight of water. The mixture is stirred, gently boiled, and, after filtering warm, is suffered to cool and repose for several days. MM. Girardin and Preisser repeated this process without any satisfactory result.

The 'Journal hebdomadaire des Arts et Metiers' points out several processes for the same purpose. The first consists in mingling 28 grms. pulverized chalk and 42 grms. slaked lime with a gallon of the oil, stirring well, and adding 0.236 litre water; after two or three hours of repose it is mixed again, and this operation repeated for two or three days; 28 grms. of common salt, dissolved in 0.710 litre water, is then added, the mixture stirred at intervals for two days, suffered to settle, and the oil drawn off.

Another process in the cold, applicable to cod oil, consists in putting into  $4\frac{1}{2}$  litres of the oil, previously prepared by the preceding process, 28 grms. of chalk; then, after twenty-four hours, 28 grms. of potash dissolved in 113 grms. water; and finally, after several hours, 57 grms. common salt dissolved in 473 grms. water. After settling a few days, the oil is drawn off.

Neither of these processes is sufficient, as MM. Girardin and Preisser have satisfactorily ascertained. The same journal asserts that the oil is obtained so pure by the following process, that it can be employed in woollen manufactures.

Put into  $4\frac{1}{2}$  litres (1 gallon) of impure oil 35 grms. chalk, an equal amount of slaked lime and 0.473 litre of water; after stirring, and a repose of several days, add 0.473 litre water and 85 grms. potash; heat the liquid, without bringing it to boiling, and draw it off when the oil has a light amber colour; it has now only a pungent, fatty odour. Finally, add 0.473 litres water, containing 28 grms. salt, and after boiling the mixture for half an hour, turn off the oil into a reservoir. This process does not refine the oil.

Many English patents for the same purpose were tested by MM. Girardin and Preisser.

One treats fish oils in the cold by bone black, in small fragments, and filters through animal charcoal after repeated agitation. Such a process clarifies the oils, and removes a portion of their empyreumatic odour, but does not in the least diminish their essential odour.

Another method, recently published in France, has succeeded no better. It consists in pouring into the oil a solution of bichromate of potash, mixing thoroughly, then adding a solution of oxalic acid. The action is energetic, but after repose and drawing off the oil still retains its characteristic odour.

There is a process among the French patents, which consists in heating the oil merely to simmering with 10 parts of water for five or six hours, and towards the close of heating adding a milk of 1 part of water with one-twelfth of chalk and one-twelfth of lime.



After settling perfectly, it is drawn off and run into reservoirs through carded wool or pounded charcoal. This process clarifies the oils, but decolorizes them imperfectly, and does not at all remove their odour.

At Rouen they refine whale oil by sulphuric acid, as in operating on seed oils; but this method removes neither colour nor odour. If, previous to this operation, it be stirred for some hours with chalk, and a current of steam be passed through it, a bleached liquid is obtained, which, by the addition of a suitable quantity of sulphuric acid, deposits plaster on settling. The clear oil, filtered through animal black, has lost a portion of its deep colour, and has not a strong odour; but it is not perfectly purified, even after many successive filtrations.

The oxygenation of oils leads to very bad results. MM. Girardin and Preisser remark, that oils filtered and treated, whether by chlorides, lime, chalk, or animal charcoal, and then left to themselves for thirty or forty days, deposit a bleached organic substance, soluble in water and æther, analogous to margarine, and, while depositing, the oil is more and more decolorized. Fish oil may be obtained, of a quality resembling fine olive oil in appearance, by exposing it to the sun, then to the action of chloride of lime, and filtering several times through animal charcoal. The odour is lessened, but not entirely removed.

A simple exposure to the sun for several months determines an abundant deposit, while the oil is clarified and sensibly purified.

If whale oil be brought in contact with caustic ley, employed cold and in small quantities, the decolorization is hastened; the mass separates into two distinct strata; the upper one, decolorized, is very fluid and limpid, but always odorous; the lower, which is very small, is a mixture of the alkaline solution, strongly coloured brown, and of all the solid portion of whale oil analogous to margarine. It is not necessary to submit the decanted oil to any other process of purification; in this state it is suitable for all manufacturing purposes, excepting on account of its odour, which is always well defined.

It appears from the experiments of MM. Girardin and Preisser on fish oils, that we at present possess no sufficiently efficacious means of removing their strong and disagreeable odour. The best method, at present, is to submit them either to the action of alkalies, or to the successive action of chalk, steam and sulphuric acid; to suffer them to repose, and filter several times through animal charcoal. We thus obtain a clear oil, less coloured, and of a less repugnant odour; but its want of odour is out of the question.

The refining and purification of fish oils is the more important, since for the last twelve years their importation has constantly increased. Thus in 1827 there was entered only 3,000,000 kilogrms., (about 6,000,000 lbs.), the greater part of which came from the islands of St. Pierre and Miquelon; while in 1839 the importations amounted to 9,200,000 kilogrms., representing a value of 5,500,000 francs.—*Journal of the Franklin Institute* for April 1843.



## REVIEWS.

*A Treatise on Food and Diet, with Observations on the Dietetical Regimen suited for disordered States of the Digestive Organs; and an Account of the Dietaries of some of the principal Metropolitan and other Establishments for Paupers, Lunatics, Criminals, Children, the Sick, &c.* By JONATHAN PEREIRA, M.D., F.R.S. & L.S., &c.

DR. PEREIRA has already established a reputation, and given abundant evidence of his qualifications for presenting a methodized view of our actual knowledge on any subject of medical science. The present work forms a suitable companion to his 'Materia Medica,' and contains, compressed into a moderately sized octavo, the contents of a library. His arrangement is novel and very good. He first treats of the ultimate elements of which the body is composed, and which therefore must be the constituents of our food, and discusses the functions of each element in the economy. This brings, of course, a review of all the mooted questions in the physiology of digestion, and the especial effects and appropriation of the aliments. Dr. Pereira seems to think Liebig's view of the origin of fat is better established than that of Dumas, but he differs from the former chemist on the nature of the digestive process. Having treated at large of all the elements of food, organic and inorganic, he proceeds to the more immediate purpose of the work. He gives reasons for differing from Prout, who arranged all aliments into four classes,—the aqueous, the saccharine, the oleaginous, and the albuminous; and proposes the following

*Classes of Alimentary Principles.*

- |                               |                        |
|-------------------------------|------------------------|
| 1. The aqueous.               | 7. The acidulous.      |
| 2. The mucilaginous or gummy. | 8. The alcoholic.      |
| 3. The saccharine.            | 9. The oily or fatty.  |
| 4. The ligneous.              | 10. The proteinaceous. |
| 5. The amylaceous.            | 11. The gelatinous.    |
| 6. The pectinaceous.          | 12. The saline.        |

Upon this arrangement he proceeds to treat of every substance which enters into the food of man, and he brings together a mass of information from the best authors upon every topic. If the amount of this information be not entirely satisfactory to a reader (which however to the greater number it will certainly be), Dr. Pereira directs them to the sources whence they may derive more, and generally he does ample justice to the original authors. If we made any exception to this, it would be, that we think Dr. Pereira is not quite fair to Liebig when he charges him with throwing suspicion upon the experiments of Despretz with respect to the source of the azote of the animal body.

He is speaking of the question as to whether nitrogen is or is not absorbed in the lungs, when he observes, "With regard to Despretz's experiments, it is deserving of especial notice, that whenever his conclusions militate against the opinions of Liebig and Dumas, they



offer sundry objections to his experiments and conclusions; but where the results of his investigations coincide with their opinions, no objections are made to his experiments." He then adds in a note, "Liebig concludes his objections to Despretz's experiments in these words:—'We can hardly be at a loss what value we ought to attach to the conclusions drawn from such experiments as those above described. These experiments, and the conclusions deduced from them, in short, are incapable of furnishing the smallest support to the opinion,' " &c. Dr. Pereira has here made a mistake. Liebig's remark, which he has quoted, is not applied by him to Despretz's experiments upon azote, but upon animal heat, and are confined to one point, which, since Liebig himself does not pretend to determine, it is no disparagement to Despretz to say he has also failed.

Another instance of a sad misconception on the part of our author will be found in the following extract from page 56:—

"Liebig asserts that all the [vegetable] poisons contain nitrogen, but *anthiarin*, the active principle of the upas tree, is devoid of it. Moreover, *elaterin* is a non-nitrogenized principle. Furthermore, no ratio can be observed between the proportion of nitrogen and the physiological effect of the vegetable-nitrogenized substances. Thus, *solanina* contains 1·64, picrotoxine 1·3, morphia about 5, strychnia about 8, quina 8·64, and caffeine 28·78 per cent. of nitrogen; yet *solanina* is a poison, caffeine not so. Lastly, the difference between the per-centage composition of quina and strychnia is too slight to admit of safe conclusion being drawn as to the cause of the difference of operation of those two bodies."

Now Liebig is not quite so positive, but appears to us merely to suggest the view that all the vegetable poisons contain nitrogen, and not, as Dr. Pereira would seem to understand it, that all nitrogenous substances are poisonous. Liebig distinctly states that "caffeine and theobromine, the most highly nitrogenized of all vegetable principles, are not poisonous," and moreover that "it [the poisonous action] is certainly not in direct proportion to the quantity of nitrogen." That the author was aware of these statements is sufficiently evident from his having embodied them in the above remarks; but this even renders it far more difficult to conceive how it was possible to give them such an incorrect interpretation. We wish it to be understood that we do not pledge ourselves to the accuracy of the view, which still requires further confirmation; but it appears to us to be a conclusion drawn from a series of facts proved by long experience. Two principles alone seem to militate against it, of which the one, anthiarine, most probably does contain nitrogen, which, perhaps on account of its small quantity, was overlooked by Mulder in his analysis of this substance; the other, elaterine, the poisonous properties of which are not proved, for no experiments have been made with the pure principle, and the purest extract (*elaterium*) contains abundance of nitrogen, as we had occasion to observe when making some experiments on that substance in conjunction with our friend Mr. Warington.

A most valuable feature in this treatise is the chapter on dietaries,



in which the author has assiduously collected together an account of the various dietaries in use in the army, navy, prisons, hospitals, and other establishments of this country and of the continent. This subject has of late been occupying the serious attention of the public, and will, we have no doubt, be most highly appreciated. It might, we think, have been published with great advantage in a separate form, so as to have rendered its distribution more general.

## PATENTS.

*Patent granted to William Rocke, Prince's End, Stafford, for Improvements in the Manufacture of Mineral Colours.*

THE invention relates to the manufacture of mineral colours from certain minerals, not hitherto employed in the manufacture of mineral colours. The minerals employed are known by the name of the new mine iron-stone, the poor robin, the rock mine, the bindes; they may be readily obtained from different parts of England. The mode of treating these minerals, in order to render them fit for use, is as follows:—

To make a good stone colour, a quantity of either of the new mine iron-stone, the poor robin, the rock mines, the bindes, is taken, and pounded or ground well up by any of the ordinary and well-known means of grinding minerals, so as to reduce it to a fine powder; it is then to be passed through sieves, when the finer parts of it will be in a fit state to be mixed with oils, according to the ordinary mode of mixing colours.

Another mode of preparing the minerals is, after they are ground to put them into water for a short time, and afterwards to draw off the water into another vessel and allow it to settle, when the minerals will be deposited at the bottom of the vessel, and when dried will be fit for use, as before described. To obtain the darker colours, such as black, brown, umber and red, a quantity of any one of the above-named minerals is placed in an oven or furnace, or any convenient place, and a slow regular heat applied, so as to calcine it until it assumes the colour required. The colour will be given according to the intensity of heat applied; thus a slight heat will give it a blackish colour, a greater heat will give a brown, and when the greatest heat is applied the colour will be umber, ochre and red. It is to be taken out of the furnace and reduced to a powder, as before described.

A workman, by a little practice, will readily be enabled to ascertain the quantity of heat required to produce the desired colour.

The minerals used to obtain a good black colour are those which are known by the name of the black clunch, the black sliper, and the black cannock. These minerals are commonly called “bat.” Any one of these minerals is reduced to a powder in the manner before described, when explaining the mode of making a stone colour.



Another part of the invention is a mode of preparing a white colour, which may be advantageously used as a body for other colours, such as yellows, greens and blues, and many others; it is done in the following manner:—A quantity of either the cannock clunch, black sliper or coal is calcined to a white ash; when cold it should be well sifted through suitable sieves, when it will be fit for use.

The inventor's claim is, manufacturing mineral colours from the minerals known by the name of the new iron-stone, poor robin, rock mine and bindes, and also from the minerals called the black clunch, black sliper and black cannock, as above described.—Sealed September 3, 1842.

*Patent granted to William Newton, Chancery-lane, for an Improved Medical Compound or Ferruginous Preparation, to give Tone and Vigour to the Human System, particularly applicable in cases of Weak Digestion, and in the diseases called "Chlorosis."*

This improved medicinal compound is a mixture or combination of ferruginous preparations with farinaceous matters, intended to be taken into the stomach by way of food, in the form of bread, biscuits, or cakes.

The invention, as communicated to the patentee by M. de Herpyon, of Paris, is directed to be carried into effect by the following means:—A given quantity of ferruginous preparation (say of the soluble salts of iron) is to be dissolved in a suitable quantity of water, and this water, so impregnated with the iron, is to be employed as the menstruum or liquid for mixing up a given quantity of flour into dough. The proportions of the iron to the flour must be according to the complaint, disease, or physical state of the patient, and may be regulated by the advice of the physician or other medical attendant. The dough, so prepared, having been properly kneaded, is to be baked into bread, biscuits, cakes, or other suitable forms, and is then fit to be eaten by the patient, as an ordinary article of food, as part of his or her daily aliment. By such administration of the iron, in small quantities, the constitution of the patient will be gradually restored to its natural tone of health and vigour, and in a much more effective and agreeable manner than if taken in doses by the ordinary means of solution, or by other modes.

This medicinal compound, when made up in the form of biscuits, may be readily carried and used at sea, or upon a journey, as an article of food, and may be continually taken by persons suffering under the complaints above alluded to. In hospitals, and in the army and navy, under circumstances of extensive prevailing disorders among the men, such as scurvy, this mode of introducing iron and other suitable medicines into bread or biscuits, subject to the direction of the medical adviser, will be found to be extremely convenient and efficacious; and the materials may be so mixed, that the patients shall not be aware of the bread which they are eating being medicated.



The proportionate quantities of the preparations, to be mixed with the flour employed for making the bread, should be regulated, as above mentioned, by the advice of a medical man, as it is impossible to give any definite directions; for, in all cases, the quantities must depend upon the state or character of the disease to be combated, and of the particular preparations of iron and other matters employed to arrest the disease, or to restore the constitution to health and vigour.—Sealed 12th June, 1839.

*Patent granted to J. E. Disbrowe Rodgers, of Middlesex, for certain Improvements in the Separation of Sulphur from various Mineral Substances.*

These improvements in the separation of sulphur from mineral substances, is founded upon the affinity of hydrogen for sulphur, and of oxygen for certain metals. The improvements consist in conveying steam through the furnace or retort, during the operation of washing or calcining mineral sulphurets, previously reduced to coarse powder; the hydrogen of the water, or a certain portion thereof, combining with the sulphur of the ore, and forming sulphuretted hydrogen; and the oxygen, previously in union with hydrogen, combining with the metal, and forming an oxide of the same metal.

When the object is to save the sulphur, vessels or retorts admitting the passage of the steam through them, so as to produce direct action upon the ore, should be used; they must be heated by fire from beneath. The retort may be charged or emptied by means of a door, by which aperture the ore may also be stirred with a rake, or other instrument, commonly used for that purpose. But where the object is merely to expel the sulphur, for the purpose of obtaining the metal with which it is combined, as in the reduction of silver, copper, and other ores, the steam may be conveyed through the usual calcining furnace; the reverberatory form being preferred.

The separation of the sulphur is more readily effected if the ore be occasionally stirred, as a fresh surface is exposed to the action of the steam. In the common method of calcination, a sub-sulphate is formed, which precludes the expulsion of the whole of the sulphur; but, in the present process, the patentee states that he has succeeded in completely separating the sulphur from the sulphurets employed; and when operating upon iron pyrites from Cornwall, he has obtained from it a perfectly pure oxide of iron.

As regards the collection of the sulphur, a certain portion is usually simply expelled, and may therefore be condensed in a chamber; that sulphur, however, which is separated, in combination with hydrogen, may advantageously be treated in two ways:—1st. It may be at once burnt, or it may be collected in a suitable gasometer, and then burnt; the sulphurous acid thus obtained being converted into sulphuric acid by any of the existing processes. 2nd. The gas may be burnt in a limited portion of atmospheric air; the hydrogen,



under these conditions alone, enters into combination with oxygen, while the sulphur is separated, and condenses in a pure state.—Sealed 12th January, 1843.

*Patent granted to William Oxley English, Kingston-upon-Hull, for Improvements in Purifying Spirits of Turpentine, Spirits of Tar and Naphtha.*

The invention consists in an improved method of purifying the unrectified spirits of turpentine, tar and naphtha, whether the unrectified spirits of turpentine may have been obtained from distilling turpentine alone or with water. This method is as follows:—A close vessel is taken, into which is introduced a pipe in connexion with a steam-boiler, so that the steam is introduced below the liquid under process, and rising up through it carries vapour therewith. From the upper part of this vessel a pipe communicates with the lower part of a second vessel. From the upper part of this second vessel a pipe communicates with the lower part of a third vessel, and so on for any number of vessels which may be found convenient. Four are used, but more would be better. The spirit which is to be purified is placed in the first of these vessels, either alone or mixed with water, and in some or all of the others water is placed, mixed either with potash, quick lime, soap leys, or any other alkali or alkaline substance, or else with sulphuric or some other acid, and in those vessels not containing such mixture pure water is placed. The mouth of the pipe opening into the bottom of each vessel must be below the liquid contained in that vessel, and at the lower extremity of each pipe is a bulb pierced with holes; and it is preferred that each of these pipes should be in connexion with the steam-boiler, so that free steam may pass through the liquid in each vessel; and the mouth of the pipe opening into the top of the vessel must be above the contents, and part of each pipe must be so elevated that the liquid in one vessel shall not flow into another; or, in place of the steam-pipes, heat is applied to the vessel in which the spirit is contained, so as to drive the spirit over in vapour, which passes along the pipes into the successive vessels, and through the liquid contained in them. The temperature of the liquids contained in the several vessels may thus be kept above the condensing point of the vapour, either by the heat of the vapour itself, or by external heat applied to the several vessels. The vapour from the last of these vessels is conducted to a condenser, and condensed in the ordinary, or any other method. The spirit is thus purified by the chemical action of the acid or alkali through which it is driven in a state of vapour, as well as by the mechanical action of the water. After the spirit has been condensed, it is further purified by filtering it through lime, or any other alkaline or acid substance.—Sealed Dec. 8, 1842.



# THE CHEMICAL GAZETTE.

No. XXI.—September 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Chemical Composition of Tea.* By M. PELIGOT.

THE most remarkable products that have been indicated in tea are,—1st, tannine; 2nd, an essential oil, to which it owes its aroma, and which has great influence on its commercial value; 3rd, a crystalline substance, very rich in nitrogen, *theine*, which is also met with in coffee (whence it is frequently termed *caffeine*), and is likewise found in Guarana, a remedy highly valued by the Brazilians.

Besides these three, M. Mulder extracted from tea eleven other substances, which are usually met with in all leaves. The same chemist found, in the various kinds of tea from China and Java, a little less than a half per cent. of their weight in theine. Mr. Stenhouse, in a recent investigation\*, obtained from 1·37 to 0·98 theine from 100 parts of tea.

An accurate knowledge of the amount of the nitrogenous principles contained in tea being of the utmost importance, I first determined the total amount of nitrogen contained in the leaf, in order thus to have a safe guide when subsequently isolating the substances between which this nitrogen is distributed.

On determining the nitrogen by M. Dumas's process, I obtained the following numbers:—

	Nitrogen in 100 parts tea dried at 230°.
Pekoe tea . . . . .	6·58
Gunpowder tea . . . . .	6·15
Souchong tea . . . . .	6·15
Assam tea . . . . .	5·10

This amount of nitrogen is far more considerable than has been detected in any vegetable hitherto analysed. These first experiments prove therefore the existence of from 20 to 30 per cent. of nitrogenous substances in tea, while former analyses scarcely carry the proportion to more than three or four hundredths. I sought for these substances successively in the products of the leaf soluble in boiling water, in those which do not dissolve in water, and in each of the substances which might be separated either from the infusion or from the exhausted leaf.

\* See 'Proceedings of the Chemical Society' in this Journal, p. 332.  
*Chem. Gaz.* 1843.



I first determined the proportion of soluble products which boiling water extracts from tea, and operated on twenty-seven kinds of tea, taking into consideration the water already contained in the leaf, either from its desiccation in China not having been complete, or from having absorbed during or after its transport a certain quantity of atmospheric water. I found that the green teas contain, on an average, 10, the black teas 8 per cent. of water.

The proportion of products soluble in hot water varies considerably, and depends principally on the age of the leaf, which is younger, and consequently less ligneous, in the green than in the black tea. On an average I found in 100 parts of—

	Parts soluble in boiling water.
Dry black teas .....	43·2
Dry green teas.....	47·1
Black teas in their commercial state .....	38·4
Green teas in their commercial state .....	43·4

When an infusion of tea is evaporated to dryness, a chocolate-brown residue remains, which, when derived from green gunpowder, contains 4·35 per cent. nitrogen, if from black souchong, 4·70 per cent. nitrogen.

These considerable quantities of nitrogen,—do they belong to several principles contained in the infusion, or solely to the theine, which is the only nitrogenous substance hitherto noticed in it? I first endeavoured to solve this question: as the quantitative determination of theine is a difficult operation from its being soluble in water, alcohol and æther, and not being precipitated by any reagent with the exception of tannine, I first ascertained whether the other substances which might be separated from the infusion contained any nitrogen.

The subacetate of lead throws down about half the soluble constituents contained in this infusion. The precipitate, which is of a more or less dark yellow, according to whether it is derived from green or black tea, contains the whole of the colouring matter, the whole of the tannine, and a peculiar acid, which affords an insoluble salt of a light yellow colour with the subacetate of lead. I have not yet terminated the examination of this acid.

I found this mixed precipitate to contain very little nitrogen; it is therefore in the portion of the infusion which is not precipitated that the substances containing this element must be sought for.

To determine the amount of theine, M. Mulder evaporates the infusion with caustic magnesia, and treats the residue with æther, which only dissolves out the theine. On modifying this process I have obtained the following quantities of theine from 100 parts of—

Hyson .....	2·40
Another kind .....	2·56
Mixture in equal parts of gunpowder, hyson imperial, caper and pekoe .....	2·70
Gunpowder .....	4·1
Another kind .....	3·5

These quantities are far more considerable than have been obtained



either by M. Mulder or Mr. Stenhouse; but, at the same time, they do not account for the total amount of nitrogen of the infusion in the state of theine, for the composition of theine being represented by the formula  $C^8H^5N^2O^2$ , and this substance containing 29.0 per cent. of nitrogen, gunpowder tea should contain 7.4 and souchong 6.5 theine in 100 parts of these teas taken in their ordinary state, if no other nitrogenous substance accompanied the theine in the solution.

By the following very simple process I succeeded in obtaining a proportion of theine far more considerable than I first found. To the hot infusion of tea subacetate of lead and then ammonia are added; the liquid is separated by filtration from the precipitate, and a current of sulphuretted hydrogen passed through it, the sulphuret of lead removed from the solution, which is evaporated at a gentle heat; on cooling an abundant crop of crystals of theine is obtained, and the mother-ley affords more crystals on cautious evaporation. The first crystals are purified by recrystallization from water, and then the mother-ley is used to dissolve the second crop so as to have the least possible quantity of mother-ley and the largest amount of crystals. In this manner I obtained from 50 grms. of gunpowder tea 1.92 gm. of crystallized theine, which is equal to 3.84 per cent.

But there remains a syrupy liquid which still contains some theine. This I determined by means of a solution of tannine of known strength, which precipitates it alone, and I believe entirely, if the liquid be cold and accurately neutralized with ammonia as the tannine is added.

On adding the fresh quantity of theine isolated by this reagent to that obtained as crystals, 100 parts of gunpowder tea, taken in its ordinary state, furnished 5.84 theine; 100 parts of the same tea in its dry state gave 6.22 of this substance.

These numbers approach very nearly to those which should be obtained if theine were the only nitrogenous substance contained in the infusion. There is however still a deficit of 0.75 nitrogen, but it must be remembered that I obtained only a minimum. It is moreover possible that the infusion contained some ammoniacal salts, or that a small portion of the theine was decomposed during the evaporation of the liquid; this substance being very liable to alteration, like the compounds rich in nitrogen, which it resembles by its composition and properties.

However this be, it may be concluded from the above experiments,—1st, that theine is the principal nitrogenous substance contained in the infusion of tea; 2nd, that it exists in far larger quantity than has hitherto been admitted.

The portion of the tea from which boiling water extracted no more soluble principle, contained in 100 parts, dried at  $230^{\circ}$ , 4.46 nitrogen for the souchong, and 4.30 for the gunpowder. These quantities, added to those of the infusion, represent very nearly the nitrogen ascertained by analysis to exist in the entire leaf.

On boiling for some time the exhausted leaves in water con-



taining a tenth of their weight of potash, a brown liquid is obtained, which affords, on the addition of dilute sulphuric or acetic acid, a considerable flocculent and brown precipitate, which contains 8.45 per cent. nitrogen; the product of another preparation gave 9.93. Alcohol and æther remove from this precipitate about 30 per cent. of a green substance, which appears to contain a fat acid. This product is not pure after this treatment, for it is strongly coloured and contains pectic acid; nevertheless that which contained 8.45 nitrogen afforded 11.35 of this element after being treated with alcohol and æther. Although I have not obtained this substance in a state of purity, I do not hesitate to consider it, from the general resemblance of its characters, as identical with the *caseine* from milk.

It is probable that this body exists in the insoluble portion of the leaf in combination with the tannine, and that the potash acts by destroying this combination. The presence of this substance in tea is a fact the more worthy of attention as it occurs to a very large amount, if, as is probable, the greater portion of the nitrogen in the exhausted leaf is derived from it. On admitting, with MM. Dumas and Cahours, 16 per cent. of nitrogen in caseine, the exhausted leaves would contain no less than twenty-eight-hundredths of this principle; tea in its ordinary state would contain from 14 to 15 per cent.

I found it impossible to separate the whole of this caseine from the tea. I obtained, in one experiment, from 100 parts exhausted leaves, 35 of the mixture above mentioned, containing from 8 to 10 per cent. nitrogen, which represent from 18 to 20 per cent. caseine supposed pure; but the leaves, after being treated twice with potash, still contained 2.73 per cent. nitrogen. This nitrogen, in the state of caseine, would represent 5.7 per cent., so that we thus approach very close to the amount of the nitrogen indicated by analysis.

It will be seen from these experiments that tea contains a proportion of nitrogen altogether exceptional; it must however be remembered that the leaf is not taken in its natural state, but that it comes to us after having been manufactured. It is well known that, before being delivered into commerce, tea is submitted to a torrefaction which softens the leaf and allows of a rather considerable quantity of an acrid and slightly corrosive juice being expressed by means of the pressure of the hands; the leaf is then rolled up, and dried more or less rapidly according to whether green or black tea is to be made from it. Now it is possible that this juice contains little or no nitrogen, and that consequently its separation would increase the amount of nitrogen which remains in the leaf. On determining the quantity contained in fresh leaves from some tea-plants cultivated in gardens near Paris, I found 4.37 nitrogen in 100 parts of the dried tea. Perhaps the difference of climate and mode of culture may suffice to produce these variations.

I will conclude this paper by some observations on the use of tea considered as beverage and as aliment. It cannot be denied, considering the amount of nitrogen contained in this leaf and the pre-



sence of caseine, that tea is a true aliment when consumed as a whole, with or without previous infusion, as, according to information, some of the Indian tribes do.

We find the following statement in one of Victor Jacquemont's letters:—"Tea comes to Cashmere by caravans, through Chinese Tartary and Thibet. . . . It is prepared with milk, butter and salt, and *an alkaline salt* of a *bitter* taste. At Kurnoor it is prepared in a different manner: the leaves are boiled for an hour or two, the water is thrown away, and the leaves mixed with rank butter," &c. Is it not evident that in the first case the instinctive use of the alkaline salt has for its object the solution of the caseine, and thus causing it to form part of the infusion, while in the second the caseine remains, and is consumed with the leaf itself?

But it is not in this manner that tea is prepared among the more civilized nations. Ought we to admit that its infusion, made with little tea and much water, has any other action but on the nervous system, by producing an excitement which may for a certain time form a substitute for veritable food? Can it be compared to other substances of undoubted efficacy as nutriment, to milk or to meat broth? Without seeking to solve these difficult questions, I have determined some of the elements which must occupy an important rank in their discussion. I have determined the weight and the nature of the principles which enter in the infusion of tea as it is usually prepared for drinking. The tea is not then deprived of all its soluble principles; the leaf still retains at least a third of what it abandons to water when submitted to frequent washings; an infusion, for instance, made with 20 grms. of gunpowder tea and 1 quart of water afforded 6.33 grms. of soluble products, containing very nearly 1 grm. of theine.—*Comptes Rendus* for July 17, 1843.

#### *On Masopine.* By M. GENTH.

The substance to which the above name has been applied was obtained from the dried sap of a tree called *Dschilte* by the native Mexicans, by whom, according to Ortigosa, who brought it to Europe, it is chewed. The sample examined was 9 inches in length, 4 inches in thickness, full of cavities and fissures, of a dull appearance, and light specific gravity. On cutting it with a knife, the surfaces of section were shining; the mass became soft between the fingers; it had scarcely any taste when chewed, but had a very decided smell of old cheese, which might be almost entirely removed by boiling in water; the residuous mass was soft and might be drawn into threads; the water was somewhat coloured and had a slight acid reaction. Absolute alcohol dissolved the residue with the exception of a small quantity of caoutchouc. On the cooling of the solution some white crystalline flakes separated, which might also be precipitated by the addition of water. It has therefore the properties of a resin.

Masopine is a light snow-white powder, void of smell and taste, insoluble in water, easily soluble in æther, from which it crystallizes



in white silky needles, sometimes grouped in tufts, which melt at 310° Fahr., giving off an agreeable odour, to an amorphous mass. On cooling it resembles glass, is of a wine-yellow colour, of great refractive power, conchoidal fracture, and affords a white powder; its melting point is now only 158° Fahr. The substance crystallized from æther and melted, was found to consist in 100 parts of—

	I.	II.	Atoms.	Calculated.
Carbon . . . . .	83.53	83.39	22	83.69
Hydrogen . . . . .	11.45	11.52	18	11.28
Oxygen . . . . .	5.02	5.09	1	5.02

On submitting masopine to dry distillation, it affords a brown, thick, oily, acid mass, from which the acid was removed by boiling with ammoniacal water. The oil, rectified over hydrate of lime, was of a light yellow colour, had an odour of ginger, and contained 88.02 carbon and 11.49 hydrogen.

The acid was separated from the ammoniacal solution by hydrochloric acid in pearly scales; it was then combined with lime, and on decomposing the lime-salt with hydrochloric acid was obtained in the form of dazzling white needles. The acid affords with nitrate of silver and ammonia a white salt, which slowly becomes black by exposure to light, very quickly by boiling, is insoluble in water, and on incineration smells decidedly of cinnamon, leaving behind 45.49 per cent. oxide of silver; it was therefore probably cinnamate of silver.

Nitric acid had a very violent action on masopine, dissolving it after long boiling to a clear liquid, which on evaporation afforded a tenacious mass, soluble in water of a yellow colour, in ammonia and potash, of a dark brown. The ammoniacal solution precipitates nearly all the metallic salts of a dirty white colour. The silver salt contained 45.46–45.57 per cent. oxide of silver. An elementary analysis afforded 30.35 carbon and 3.37 hydrogen. From want of material it was impossible to determine the nitrogen.—*Ann. der Chem. und Pharm.*, xlv. p. 124.

*On the Influence of Temperature on the Production of Iodoform, and on the Octahedral Crystallization of Iodide of Potassium. By M. BOUCHARDAT.*

Chemists are already acquainted with several examples of the influence of temperature in chemical reactions. I will now cite a new fact, which appears to me worthy of notice. Serullas discovered iodoform by acting with tincture of iodine on an alcoholic solution of potash. This method of preparing that interesting product is somewhat expensive. In a Memoir inserted in the 23rd volume of the 'Journal de Pharmacie,' in which I examined several analogous products, I noticed some alterations which might be made in the process for the preparation of iodoform. On repeating lately these experiments I made several unexpected observations, which I will now describe.

If alternately iodine and potassa be added to water slightly alco-



holized, containing iodide of potassium in sufficient quantity to decolorize and again colour the liquid, it becomes heated, and the successive production of acetic æther and of iodoform is observed without any trace of iodate of potash.

But if, on the contrary, iodine is dissolved in alcoholized water containing iodide of potassium in solution, and an aqueous solution of potash be added to this mixture, but not in sufficient quantity to decolorize the liquid, then some more iodine, and again potash, but not sufficient to produce decolorization, not a trace of iodoform is produced. The oxygen which the iodine liberates from the potash combines with the alcohol to convert it into acetic æther, which may be easily isolated, but the action does not go further. As soon as the whole of the alcohol has been transformed into acetic æther, the liberated oxygen combines with the iodine in order to form iodate of potash, which is deposited.

Thus, with an excess of iodine at the ordinary temperature, there is no production of iodoform from the reciprocal action of the iodine on the alcohol under the influence of the potash; only acetic æther is obtained. On the other hand, when alcohol, iodide of potassium, and iodine in excess are added to an aqueous solution of carbonate of potash (the alcohol must not be in such proportion as to separate the saline solution), and this mixture is exposed to a temperature of  $140^{\circ}$  Fahr., an abundant production of iodoform is observed after a few hours, iodine always being present in excess.

It was a long time before I was able to explain this difference of action under circumstances which appeared to be identical; I could not conceive how it was I obtained with caustic potash acetic æther and nothing else, while with carbonate of potash iodoform resulted.

After several vain endeavours to ascertain the cause of this difference, I found that, in order to facilitate the reaction with the carbonate of potash, I was compelled to employ a temperature of  $140^{\circ}$  Fahr., while with pure potash I was acting with a temperature of from  $60^{\circ}$  to  $70^{\circ}$  Fahr. Has this difference of temperature any decided influence on the mode of reaction? To decide this I raised a solution of iodine and of iodide of potassium in alcoholized water to a temperature of  $140^{\circ}$  Fahr., and then conveyed into the mixture a solution of caustic potash, and observed the immediate formation of iodoform. Thus then a difference so decided and distinct between the two reactions depends solely on the difference of temperature.

Before I was aware of the cause of this phænomenon I made several experiments which led to nothing; but one gave me a result unconnected with the cause which I was seeking, and which is not of less interest.

On evaporating the saline solution containing the iodine, iodide of potassium and acetic æther, I obtained semi-transparent octahedral crystals of a slightly yellow colour. These crystals, heated in a tube, furnished some traces of iodine; the fused residue consisted solely of iodide of potassium. I prepared a solution of the biniodide



of potassium; this solution, left to spontaneous evaporation, afforded the same octahedral crystals.

In order to obtain these crystals without fail, the presence of a large excess of iodine during the crystallization is indispensable. The crystals do not consist of a definite compound, for the proportion of free iodine is exceedingly small; it does not amount to  $\frac{1}{1000}$ : but it is curious to find iodide of potassium lose its prevalent form under the influence of a minute proportion of iodine. It appears probable to me that this fact is more general than is thought, and that several bodies assume different forms, or forms derived from the prevalent one, on account of the mixture of some traces of substances foreign to their definite constitution\*.—*Journ. de Pharm.* for July.

*On Fermentation.* By Prof. E. MITSCHERLICH.

Fermentation is effected by a vegetable, putrefaction by an animal production. In the course of the two last winters the author observed in a large number of putrefying substances only one species of Infusorium to be developed, which consisted of one or of several globules, in the latter case arranged in series; the diameter of such globules was about  $0.001^{\text{mm}}$ , the motion vibratory. According to his observations it would seem probable that the other animalcules, which are observed in putrefying substances, have been conveyed into them by means of the atmosphere, insects, or some other means. A certain quantity of oxygen is requisite for the development and existence of these Vibriones, and the putrefactive process is dependent, according to the author, on the free access of a certain amount of atmosphere to the decaying substances. The maceration of vegetable substances in water, even when the temperature in the rooms is kept at a summer heat, appears to depend solely on these Vibriones, when the substances are employed in a clean state. During this process nitrogen is disengaged. These Vibriones are widely diffused in the intestinal canal throughout its entire course, in the cavity of the mouth, and in the stomach, of which it is very easy to be convinced by examining under the microscope the matter which collects or remains on the teeth; sometimes they are even found on the skin, but the author has hitherto not succeeded in detecting them in the blood, in the milk, in urine, in the gall, or in other fluids of this kind.

When a little sugar is added to the liquid in which these animals are formed, their number augments considerably, and at the same time a vegetable production is generated, viz. ferment. If a larger amount of sugar be added, the production of these animals is suspended or ceases entirely, and a greater quantity of ferment is formed. The author has never observed ferment to be formed in a liquid which contained no sugar. Whether a fungus be the fermentative fungus

\* The dagger-form which common salt assumes when crystallized from a solution containing urea, is probably another instance of this remarkable fact.—*Ed. Chem. Gaz.*



or another species, may be determined with certainty under the microscope; but also very easily by adding some of it to a solution of sugar, and observing whether any fermentation ensues. In a clear liquid, in which it is possible for ferment to be produced, a turbidness is first perceived, and under the microscope globules of various sizes, from the smallest dimensions hitherto observed up to a diameter of  $0.01^{\text{mm}}$ . From day to day the small globules increase in size, and many new ones become apparent. In some liquids, as for instance in the juice of the grape, only a few individual globules are observed, which are generally of an oval form; and sometimes, but rarely, a second is developed at one of the extremities, but this never attains to the size of the primitive globule. Ferment which has been produced for some time by means of other ferment is otherwise circumstanced; from having been multiplied through a series of years it has acquired a constant character. In the breweries two kinds of ferment may be distinguished with certainty, the bottom ferment and the top ferment. The former multiplies at a temperature which must not exceed  $48^{\circ}$ , nor go below  $32^{\circ}$  Fahr.; this is the ferment in Bavarian beer. The most beautifully developed top ferment is that of Berlin white beer, which multiplies at a temperature of about  $77^{\circ}$ . Bottom ferment consists of single globules of various sizes. The author never observed a small globule to be formed on any part of a large one; the smaller globules are always diffused throughout the liquid. In top ferment scarcely ever could any single small globules be detected, but only large ones, at the extremities of which the smaller globules were developed, thus forming ramifications. These increase therefore by the production of gems; the bottom ferment, on the contrary, by small globules growing isolated in the liquid. The author exhibited drawings of the two species of ferment in the various periods of their development. In the older ferment an envelope and granular contents may be readily distinguished, which becomes however more evident on the addition of a drop of aqueous solution of iodine. By means of a compressorium invented by the author, the granular contents may be easily pressed out under the microscope. The author considers it probable that in the bottom ferment the globules burst and disburthen themselves of their contents, from each granule of which a new globule is developed, so that the bottom ferment would be multiplied by sporules.

Substances which act as poisons on fungi destroy the action of ferment, for instance corrosive sublimate, and other substances of similar nature; but liquids which act most violently on the animal frame, such as tartar-emetic, in solutions of which fungi very readily develop, do not disturb the process of fermentation.

Several fungi which are known as vegetable diseases are similarly circumstanced, as for instance dry rot to woody fibre; and with these facts a new field is evidently opened, explanatory of the decompositions which the roots of plants are capable of effecting in the soil; and it may be expected that we shall be able to demonstrate by experiment, what general experience has shown, that the



roots of plants, when unable to obtain from the atmosphere the substances requisite for their development, take them from the soil; and it is not improbable that the roots themselves effect the necessary decomposition of the substances contained in the soil, just as the greater portion of vegetables obtain the requisite substances for their first development from the seed itself. Although this is difficult to prove in the higher order of plants, it may be proved more definitely in the lower tribes, especially in the fungi, as for instance in the champignon. The process of fermentation is therefore of considerable interest. One of the most important chemical combinations is decomposed by a contact-substance, which contact-substance is an organized being belonging to the most simple forms, the development of which may be traced in the most easy and certain manner; but its first origin is moreover of great interest, for it is formed in a liquid in which it appears as numerous points so small as to escape observation.

M. Mitscherlich promises to communicate in a subsequent paper his observations on the various processes of fermentation which give rise to the formation of wine, alcohol, and the different kinds of beer, which we shall not fail to place before our readers immediately on their appearance.—Poggendorff's *Annalen*, No. 5 for 1843.

*A Statement of Experiments showing that Carbon and Nitrogen are Compound Bodies, and are made by Plants during their Growth.*  
By ROBERT RIGG, Esq., F.R.S.

The author, finding that sprigs of succulent plants, such as mint, placed in a bottle containing perfectly pure water, and having no communication with the atmosphere except through the medium of water, or mercury and water, in a few weeks grow to more than double their size, with a proportionate increase of weight of all the chemical elements which enter into their composition, is thence disposed to infer that all plants make carbon and nitrogen; and that the quantity made by any plant varies with the circumstances in which it is placed.—*Proceedings of the Royal Society* for June 15, 1843.

*On Sulpho-cinnamic Acid and some of its Salts.* By M. HERZOG.

When concentrated sulphuric acid is poured over cinnamic acid, taking care not to employ too large an excess of the former, and water is then added, a portion of the cinnamic acid again separates; but when for every part cinnamic acid from 8 to 12 parts Nordhausen sulphuric acid of 1.92 to 1.87 spec. grav. are employed, no sediment, or but traces of a brownish powder, subside on the addition of water to the clear solution. It dissolves in the sulphuric acid with a very faint evolution of heat, and without any production of sulphurous acid. After diluting with water the liquid is boiled with carbonate of barytes, until a filtered sample is no longer rendered turbid by chloride of barium. The barytes salt thus obtained is best decomposed with subacetate of lead, and the precipitate



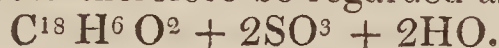
treated with sulphuretted hydrogen. The colourless liquid filtered from the sulphuret of lead is first evaporated in the water-bath, but at last under the air-pump over sulphuric acid. The acid does not crystallize from the aqueous solution, but is obtained in the dish as an amorphous, faintly yellow-coloured mass.

The sulpho-cinnamic acid prepared in this manner does not lose in weight by exposure to a temperature of  $212^{\circ}$  Fahr.; it attracts a little moisture from the atmosphere, dissolves easily in water and in alcohol. The solution has an acid reaction and a slightly acid taste. On the spontaneous evaporation of the alcoholic solution it crystallizes in tolerably long prisms; the crystals contain water, and attract moisture without deliquescing; they lose, however, both under the air-pump, and by exposure to air at  $77^{\circ}$ , not only all moisture, but also their water of combination, and become white. According to an approximative determination, they contain 6 atoms of water of crystallization. Heated in a glass tube, the acid dried at  $212^{\circ}$  melts, then gives off water, does not volatilize, but is carbonized, diffusing aromatic vapours. The carbon burns with difficulty on platinum foil, but entirely.

The acid dried at  $212^{\circ}$  consists in 100 parts of—

			Atoms.		Calculated.
Carbon	47.54	47.619	18 =	1375.83	47.80
Hydrogen	3.83	3.702	8 =	99.83	3.47
Oxygen	13.96	48.679	{ 4 =	400.00	13.90
Sulphuric acid	34.67			2 = 1002.33	34.83
	100.00	100.00		2877.99	100.00

The acid (CiS) should therefore be regarded as



When concentrated nitric acid is poured over sulpho-cinnamic acid, it dissolves gradually, without any disengagement of gas, without any liberation of heat, and without separation of crystals; it may even be gently heated without any perceptible reaction; but if the temperature is raised to  $112^{\circ}$ , reaction ensues and bubbles of gas escape. At  $122^{\circ}$  the evolution of gas is considerable, the tube fills with yellowish-red vapours, and some groups of crystals are seen to form in the liquid, which vanish on cooling, but again make their appearance when the liquid is heated, without their quantity however being increased. No smell of bitter almonds was perceptible even when the temperature had been raised to  $194^{\circ}$ , either in the hot or cold liquid. Not a trace of sulphuric acid could be detected by means of chloride of barium in the nitrate solution after dilution with water; but after some time a small crystalline precipitate formed, which however did not appear to be bisulpho-cinnamate of barytes.

Submitted to distillation with hydrochloric acid and alcohol, returning what passed over three times, no foreign body could be detected in the product, nor was any separation perceptible in the small quantity of liquid which remained in the retort; but when some of the latter was allowed to evaporate on a watch-glass by



exposure to the atmosphere, some small points formed, around which some very pretty crystals arranged themselves in stellate groups. They were easily soluble in water and in alcohol.

Pure sulpho-cinnamic acid produces precipitates only in solutions of basic acetate of lead, protonitrate of mercury, and, after some time, in that of chloride of barium. The alkaline sulpho-cinnamates behave nearly in the same manner; consequently most of the combinations are very soluble.

The acid is bibasic. In the neutral salts there are 2 equivalents of base, and in the acid salts 1 of base and 1 equivalent of water, which cannot be expelled at  $212^{\circ}$ . The combinations with the alkalis and earths afford on incineration sulphate and sulphite, and after ignition a residue, which gives off sulphuretted hydrogen on the addition of an acid. The combinations with the metallic oxides afford on ignition sulphurets, on which account they are not so well qualified for the determination of the bases as the salts of the alkalis and earths.

*Neutral Sulpho-cinnamate of Potash* is obtained either by direct neutralization of the acid, or by decomposing the sulpho-cinnamate of barytes with sulphate of potash. The salt does not crystallize on the evaporation of the filtered liquid, but affords an amorphous, somewhat yellow-coloured mass, which attracts moisture from the atmosphere, but does not deliquesce. It is easily soluble in water; the solution is neutral. When hydrochloric acid is added to the aqueous solution, and the whole evaporated at a gentle heat, the acid salt separates in groups of minute acicular crystals. Both salts dissolve with difficulty in alcohol. The neutral salt, dried under the air-pump, gave off, at  $212^{\circ}$ , 2.9 per cent. water; it contained 30.1 per cent. potash. Calculating according to  $\overline{\text{CiS}}$ ,  $2\text{KO} + \text{aq}$ , 29.9 potash and 2.85 water are required.

*Neutral Sulpho-cinnamate of Barytes*.—When nitric acid is added to the above-mentioned liquid, and the whole is then evaporated, or when the neutral salt is boiled with water to which some nitric acid has been added, the acid salt separates on cooling, if the liquid is sufficiently concentrated, in beautiful acicular crystals. It suffers no alteration from exposure to the atmosphere, dissolves with difficulty in alcohol and in water, loses its lustre at  $212^{\circ}$ , and gives off 2 atoms of water of crystallization. When heated it leaves behind only sulphate of barytes. Dilute solution of ammonia added to the crystals dissolves them easily, and a double salt crystallizes from the liquid in aggregated prisms, which lose water and ammonia by exposure to the air.

The air-dried salt loses, at  $212^{\circ}$ , 5.74 per cent. water. That dried at  $212^{\circ}$  contains 25.875 per cent. barytes. Calculation according to  $\overline{\text{CiS}}$ ,  $\text{BaO}$ ,  $\text{HO} + 2\text{aq}$  gives 5.70 and 25.706.

*Sulpho-cinnamate of Silver*.—This salt can neither be prepared in the regular form nor by precipitation; it is therefore best obtained from the neutral solution of the barytes salt by means of sulphate of silver. The filtered liquid is evaporated in the water-



bath, and at last brought under the air-pump, when it gradually dries to a somewhat gray, shining, brittle mass. It is necessary to guard against reduction when evaporated over the open fire, for even when there is still a considerable quantity of fluid the whole suddenly solidifies to a gelatinous mass. The dry salt dissolves easily in hot water, in nitric acid and in ammonia. The silver must however be determined by means of hydrochloric acid, as on ignition some sulphuric acid remains with the metallic silver, which gives inaccurate results. The salt contains 52.115 per cent. oxide of silver; the calculation requires, according to the formula  $\text{CiS}$ ,  $2\text{AgO}$ , 52.25.—*Journ. für Prakt. Chem.*, xxix. p. 51.

*Observations on the Relation which exists between the Respiratory Organs of Animals, and the Preservation of Independent Temperatures.* By GEORGE MACILWAIN, Esq., Consulting Surgeon to the Finsbury Dispensary.

The author expresses his dissent from the prevailing opinion that the temperature maintained by animals above the surrounding medium is proportionate to the extent of their respiration; and adduces many instances among different classes of animals in which he can trace no such correspondence, and others, on the contrary, where increased powers of respiration appear to diminish instead of raising the animal temperature. Hence the author is disposed to regard respiration as a refrigerating rather than a heating process.—*Proceedings of the Royal Society* for June 15, 1843.

*On the Compound Nature of Nitrogen.* By GEORGE J. KNOX.

Soon after the discovery of the bases of the alkalies and earths by Sir Humphry Davy, the compound nature of nitrogen began to be a subject of discussion amongst chemists; but the arguments in favour of this supposition, deduced principally from the nature of the ammoniacal amalgam, led to no satisfactory physical results.

The experiments of Sir Humphry Davy on the ammoniacal nitruret of potassium, and those of Despretz and Grove on the compounds of nitrogen with iron, copper, &c., have shown that the metals singly (even when aided by the most powerful electrical induction) have not the power of decomposing nitrogen. There is one experiment, however, by Sir Humphry Davy, from which one might deduce its compound nature.

Upon heating ammonia-nitruret of potassium in an iron tube, he obtained more hydrogen, and less nitrogen, than the ammonia ought to have given.

Again: on mixing this substance with a greater proportion of potassium, he obtained still more hydrogen, and less nitrogen; whereas, on heating the same substance in a tube of *platinum*, the potassium alloyed with the platinum, and the ammonia was given off almost entirely undecomposed.

How can these experiments be explained except upon the suppo-



sition that the potassium and the iron had *conjointly* decomposed the nitrogen? The latest experiments which bear upon this subject, and from which I received the idea which led me to this investigation, are those of Dr. Brown "upon the conversion of carbon into silicon," an explanation of phenomena which appears to me most unreasonable, and contrary to all chemical analogy; whilst the supposition of the carbon having reduced the nitrogen is not only a simple but an unavoidable conclusion to arrive at, if nitrogen be a compound substance. To determine, by experiment, the correctness or incorrectness of this idea, it were only necessary to reduce nitrogen by some other substance than charcoal; and should silica result from its decomposition, the problem might be considered to be solved.

Exp. I.—A considerable quantity of ammonia-nitruret of potassium was formed, by passing ammonia over potassium heated in an iron tube; the part which had not been in contact with the tube, having been examined for silica, contained none.

Exp. II.—Ammonia was passed for several hours over pure iron, heated to a dull red heat; examined for silica, it contained none.

Exp. III.—Ammonia-nitruret of potassium was heated with pure iron in an iron crucible, for one half-hour, over a large Rose's lamp; the contents of the crucible, on examination, gave silicon and silica, the weight of which was not registered, as it might have been said to have derived a portion of silica from the inner surface of the crucible.

Exp. IV.—Twenty grains of ammonia-nitruret of potassium were heated with twenty grains of pure iron in the *same* iron vessel for one half-hour; when treated with nitric and muriatic acids there remained insoluble a small quantity of a brownish colour, which, when fused with carbonate of potash, gave of silica 0.10. The solution, supersaturated with potash, filtered, neutralized, evaporated to dryness, gave of silica 1.450; sum total of silica 1.550.

From these experiments, together with those of Sir Humphry Davy mentioned above, one might infer that nitrogen is either a compound of silicon and hydrogen, or of silicon, hydrogen, and oxygen; to determine which, synthetically, a current of dry muriatic acid gas was passed over siliciuret of potassium (formed by heating silica with potassium), placed in a bent tube of Bohemian glass, the extremity of which dipped into a cup of mercury, lying on the bottom of a vessel filled with water. The atmospheric air had been previously expelled from the apparatus by a current of hydrogen.

The gases insoluble in water having been collected, were found, on examination, to be hydrogen and nitrogen, the relative proportions of which varied in different experiments.

In two experiments the proportions of hydrogen to nitrogen were four of the former to one of the latter.

In a third experiment, as six of hydrogen to one of nitrogen.

In a fourth, as five of hydrogen to four of nitrogen.

*Observation.*—White fumes appeared occasionally in the tube, indicating the presence of muriate of ammonia.—*Philosophical Magazine* for August 1843.



*On the Respiration of the Leaves of Plants.* By WILLIAM  
HASELDINE PEPYS, Esq., F.R.S.

The author gives an account of a series of experiments on the products of the respiration of plants, and more particularly of the leaves; selecting, with this view, specimens of plants which had been previously habituated to respire constantly under an inclosure of glass; and employing, for that purpose, the apparatus which he had formerly used in experimenting on the combustion of the diamond, and consisting of two mercurial gasometers, with the addition of two hemispheres of glass closely joined together at their bases, so as to form an air-tight globular receptacle for the plant subjected to experiment.

The general conclusions he deduces from his numerous experiments conducted during several years, are, first, that in leaves which are in a state of vigorous health, vegetation is always operating to restore the surrounding atmospheric air to its natural condition, by the absorption of carbonic acid and the disengagement of oxygenous gas: that this action is promoted by the influence of light, but that it continues to be exerted, although more slowly, even in the dark. Secondly, that carbonic acid is never disengaged during the healthy condition of the leaf. Thirdly, that the fluid so abundantly exhaled by plants in their vegetation is pure water, and contains no trace of carbonic acid. Fourthly, that the first portions of carbonic acid gas contained in an artificial atmosphere, are taken up with more avidity by plants than the remaining portions; as if their appetite for that pabulum had diminished by satiety.—*Proceedings of the Royal Society* for 1843.

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## ANALYTICAL CHEMISTRY.

*Method of analysing Compounds of Cyanogen and of Sulphur.*  
By M. V. GERDY.

IN May of last year I mentioned incidentally in a note which M. Dumas had the kindness to read before the Academy, that solution of iodine acts upon the cyanides as well as on the sulphurets. I believed this fact might be employed in the analysis of cyanides, either when soluble *per se*, or in combination with other compounds of cyanogen, and have already obtained a number of very satisfactory results. I have shown that in many of the soluble combinations of cyanides the cyanogen may be substituted atom for atom by iodine, so that from the amount of the solution of iodine employed and decolorized before its action on starch becomes evident, it is possible to calculate with the greatest ease, and in a moment, the amount of the cyanogen contained in the liquid, and the quantity of metal with which it was combined.

I have been able to analyse cyanide of potassium with great accu-



racy, and it would do equally well for the other combinations of cyanogen with the alkalies. The same with respect to cyanide of mercury, and also for the double compound of cyanide of potassium and cyanide of silver, which contains 8 atoms of cyanogen to 1 of silver, *i. e.* 3 atoms of cyanide of potassium are combined with 1 atom of cyanide of silver; further, for the cyanide of silver dissolved in ferrocyanide of potassium, and also for the cyanide of potassium and copper, and for cyanide of gold dissolved in cyanide of potassium, &c. The analysis of the cyanide of gold, according to this method, is not so easy of execution as is the case with the previously enumerated compounds, and requires some caution. The reaction is here also of a quite different description; for while 8 atoms of cyanogen are requisite to dissolve 1 atom of gold, *viz.* 4 atoms combined with gold and 4 with the potassium, 4 atoms of iodine alone suffice to effect the decomposition. This appears to me to be owing to the cyanide of gold not being acted on by the iodine, and being only precipitated entirely when the iodine has decomposed the whole of the cyanide of potassium. With respect to the ferro-cyanide of potassium, this is in too intimate combination to be attacked by iodine.

I also thought that by this process the amount of metal contained in other combinations might be determined, and that it might be possible in this manner to ascertain the amount of silver in the neutral nitrate of silver, and likewise the mercury in the nitrate of mercury.

I can however only give indications on these various points. When I shall have extended my researches and have collected a considerable number of facts, I will lay before the Academy more complete details respecting these questions.

In a previous communication I have asserted that solution of iodine cannot be employed for the analysis of mineral waters which contain sulphurets and hyposulphites at the same time, because the iodine behaves otherwise towards the hyposulphites than it does to the sulphurets. The accuracy of this assertion has been denied by M. Henry, who maintains that the sulphites and hyposulphites behave precisely in the same manner towards solution of iodine as the sulphurets and sulphuretted hydrogen. It is true for the sulphites, which I did not allude to, but it is perfectly incorrect with respect to the hyposulphites; for while 1 centigram. of sulphur in a sulphuret, if I may so express myself, decolorizes and absorbs nearly 8 centigrms. of dissolved iodine, 1 centigram. of sulphur in a hyposulphite absorbs only 2 centigrms., or nearly 21 millegrms. of iodine, *i. e.* the amount of iodine absorbed in the second case is to that absorbed in the former as  $2 : 7\frac{1}{2}$ . The difference, as will be evident, is very considerable, and arises from two very different reactions. The amount of iodine absorbed by a hyposulphite is nearly half that which would be requisite to saturate the half of the base; I say nearly, because calculating according to the atomic weights, I have not succeeded in obtaining perfect accordance, and some more experiments are necessary on this point. With respect to the result



of this mixture, I have observed that the hyposulphuric acid is not decomposed; it appears to combine with the iodine, or merely to dissolve it. Sometimes it also seemed to me as if a little sulphuric acid was formed from the action of the iodine, but I did not find the quantity of this acid to correspond with that of the hydriodic acid which should have originated from the iodine absorbed. However it may be, it is evident from this fact that, as I have stated above, the sulpho-hydrometer does not suffice for the analysis of a combination of a sulphuret with a hyposulphite. It is however of some service in such a case, but other means must also be employed for the analysis.

The sulphites absorb exactly the same quantity of iodine as the sulphurets when the amount of sulphur is the same, and this is exactly the quantity of iodine that would be necessary to convert the whole of the sulphite into a sulphate by decomposition of water, the hydrogen of which forms with the iodine hydriodic acid. But it appears that a portion of the oxygen set free escapes combination, for the amount of sulphuric acid is always somewhat smaller than it should be according to the quantity of sulphite in the solution.

I am moreover inclined to believe that it is impossible to be convinced of the contemporaneous presence of a sulphuret and of a sulphite in a mineral water, since a solution of a sulphuret is converted in the presence of a sulphite very rapidly into a hyposulphite without the sulphite itself undergoing the same change; this I have confirmed by numerous experiments. Thus, for instance, 10 centigrms. of sulphur as sulphite converted 20 centigrms. sulphur, contained in the solution as penta-sulphuret, into hyposulphite.

The method of analysis which I have recommended is capable of being rendered far more simple; for instead of employing ferrid-cyanide of potassium and another salt, such as perchloride of iron, at the same time, it suffices to add a few drops of ferrid-cyanide of potassium to the mineral water under examination, and then to add a solution of chlorine in excess to convert the whole of the sulphur into a sulphate, whether it existed previously as a sulphuret, sulphite, hyposulphite, or as sulphuretted hydrogen. When the entire amount of the sulphur is known, it will be very easy to determine that of its various compounds.—*Comptes Rendus* for Jan. 2, 1843.

#### *Detection of small Quantities of Iodide of Potassium.*

When an aqueous solution of iodide of potassium or of iodide of sodium is treated with iodic acid, iodine instantly separates. According to M. Winckler, 6 equiv. of iodic acid form with 5 equiv. iodide of potassium, 5 equiv. iodate of potash and 6 equiv. of iodine are separated. Taking care to avoid those circumstances under which iodic acid itself is reduced, the addition of iodic acid and starch may be most advantageously employed for detecting small quantities of iodide of potassium. Probably bromic acid behaves similarly towards bromide of potassium and bromide of sodium.—*Jahrb. für Prakt. Pharm.*, v. p. 207.



## PHARMACOLOGY.

*Pharmaceutical and Toxicological Experiments on Digitalis.**By M. BONJEAN.*

WHEN the powder of the leaves of *Digitalis* is treated by displacement with water, a very bitter solution is obtained, which contains nearly the whole of the active principles. On acidulating sufficiently the solution with sulphuric acid a green resin is separated, in which appears to reside the diuretic virtues of this plant. This resin is insoluble in æther, soluble in dilute alcohol, and the alcoholic solution may be mixed in every proportion with water without the resin being precipitated, although it is insoluble in water.

Powder of *Digitalis* exhausted with water, abandons subsequently to alcohol the whole of the chlorophylle mixed with a fresh portion of resin, which appears to be of the same nature as that which sulphuric acid throws down from the aqueous infusion of the powder. After this twofold treatment the *Digitalis* is reduced to about half its weight. The powder, exhausted by water and alcohol, only contains a small quantity of a green colouring substance, or chlorophylle, which may be easily isolated by means of sulphuric æther.

1 oz. of *Digitalis* powder furnishes about 18 to 20 grms. of a green resin, and 14 to 15 grms. of chlorophylle. It is to this latter substance that the tincture of *Digitalis* owes its beautiful green colour. It is therefore obvious that this colour has not the least influence on the properties of the remedy, and that the tincture will be the richer in green colouring substance the weaker the alcohol employed in its preparation.

To be as efficacious as possible, the tincture of *Digitalis* should be prepared with alcohol of 0·975 to 0·972, and not with alcohol of 0·829 spec. grav., as is recommended by all authors. I consider the aqueous extract to be the most certain and most energetic of all the preparations of this plant.

When powder of *Digitalis* is acted upon directly with æther, the whole of the chlorophylle is extracted, and nothing more. In this manner a tincture of a superb green is obtained, but entirely deprived of medical properties, contrary to the opinion of MM. Leroyer of Geneva, Planavia and others, who regard æther as the best solvent for the active principle of the *Digitalis*. For my part I have convinced myself that the æthereal tincture of *Digitalis* possesses no other properties than those which belong to the æther itself.

The author then proceeds to describe several experiments made on some fowls with different preparations of this plant, from which he draws the following remarkable conclusions:—"That the purple *Digitalis* has no injurious effect on fowls, to which very large doses of this plant were administered either in powder or in the form of aqueous or resinous extract. The flowers of the foxglove have no more action as a poison on these animals than the leaves. These results are very remarkable, if we consider that 6 grs. of the powder



of *Digitalis* is sufficient to cause, in the space of twelve to fifteen hours, the death of a strong dog (See Orfila's 'Traité des Poisons,' 3rd edit., vol. ii., p. 285), while  $1\frac{1}{2}$  to 2 oz. administered to fowls in the space of twenty-four hours produce no morbid appearances. It is not possible to assign this inertness to the specimen of *Digitalis* employed in my experiments, when every day the physicians affirm the efficacy of the same plant prepared in my laboratory as a therapeutic agent.

"I had occasion to observe a fact of this kind in numerous experiments which I made on various animals with ergotized rye. Sometimes the oil extracted from this substance acted immediately in a dose of a scruple on fowls, which were narcotized within four to five minutes, and died in the space of a few hours. Sometimes the same oil, extracted from the same powder, and obtained in the same experiments, had no appreciable effect on these animals, even in the dose of 2, 3 or 4 scruples. In this latter case the poison produced merely a simple local irritation, and passed completely without being absorbed into the evacuations, where the oil was found 1 or 2 hours after its injection. M. de Gasparin recently announced to the Academy of Sciences that arsenious acid was not a poison for sheep affected with pleurisy\*. I now announce a fact which, if not so important in its consequences, is at least as curious, viz. that the purple *Digitalis*, which is a poison for man and dogs, has no injurious action on fowls in a state of health."—*Journ. de Pharm.* for July.

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## CHEMICAL PREPARATIONS.

### *Preparation of Nitric Æther—Action of Nitric Acid on Alcohol.*

By M. MILLON.

ALL attempts hitherto made to combine nitric acid with æther have proved abortive. This void in the midst of the extensive series of compound æthers was quite singular, and the absence of this combination had become more remarkable since the discovery of the nitrate of the oxide of methyle.

The influence which nitrous acid mixed with nitric acid has on the oxidation of the metals, led me to suspect that the production of nitrous acid might likewise modify the oxidation of organic substances by nitric acid. I have now succeeded in changing entirely the action of nitric acid on alcohol by preventing the production of nitrous acid, for which purpose it is only requisite to add a few crystals of the nitrate of urea to the mixture of alcohol and acid; the distillation then goes on quite easily over an open fire, and instead of the impetuous and violent action which hitherto furnished nitrous æther mixed with a large number of other products, one new pro-

\* This assertion of M. Gasparin was however not confirmed by the commission appointed by the Academy of Sciences to inquire into the subject. See this Journal, p. 199.—Ed.



duct, and that only, is obtained, accompanied by a little water and alcohol.

The nitrate of urea suffers scarcely any loss in weight; it is deposited at the end of the distillation, which should not be carried too far, in a crystalline state, in the midst of a strongly acid residue.

If the nitrate of urea employed for this purpose be yellow and very much coloured, it is re-obtained perfectly white; thus in many cases the purification of the nitrate of urea may be combined with the preparation of the nitric æther.

The analysis of the pure nitric æther led to the formula  $\text{NO}^5 \text{C}^4 \text{H}^5$ . An aqueous solution of caustic potash does not decompose it, but an alcoholic solution destroys it even in the cold, and affords an abundant crop of crystals of nitrate of potash without a trace of nitrite.

The odour of the æther is soft and sweet, totally dissimilar to that of nitrous æther. Its taste is very sweet, with a slight touch of bitter; its density, greater than that of water, is 1.112 at 63° Fahr. It boils at 185° Fahr., and burns with a very white flame. It is decomposed at a temperature somewhat above its boiling point. I have several times deflagrated without explosion balloons of from 200 to 300 grms. capacity, which were filled with the vapour of the æther; but on attempting to take its density in M. Dumas's apparatus, the whole was shattered in pieces with great violence, just as the drawn-out tube was fusing under the flame of the blowpipe.

Nitric, hydrochloric and sulphuric acids destroy it very rapidly; chlorine acts on it, and destroys it at the same time; the action is accompanied by an abundant production of nitrous acid vapour.

The intervention of the nitrate of urea in the production of nitric æther, is explained by the action of nitrous acid on urea; this acid instantly decomposes it into equal volumes of nitrogen and carbonic acid; the presence therefore of the urea necessarily prevents the formation of nitrous acid at the expense of the nitric acid. The first tendency of nitric acid, in its action on alcohol, is similar to that of all the volatile acids, viz. the production of a compound æther; but if a little of the nitric æther happens to be destroyed, or its formation is accompanied by the slightest production of nitrous acid, then this immediately commences a new action; and if but an elevation of temperature result, it will readily be conceived what numerous reactions may be effected between two such liquids as alcohol and nitric acid.

Thus it is only when nitrous acid becomes present in the nitric acid that the transformations occur between the elements of the alcohol, which have generally been attributed to the nitric acid. This is no longer the sole cause; it may be even said that it is not the direct cause, but only acts as a source of the nitrous acid. Alcohol, in fact, behaves like the metals towards nitric acid and *aqua regia*. There is a mixed reaction, in which the different terms and phases are confounded one with the other.—*Comptes Rendus*, July 24, 1843.



Extracta narcotica cum Saccharo, and Moschus cum Saccharo,  
according to M. GAUGER.

Narcotic extracts are frequently ordered in a pulverulent form, mixed with sugar. As the mixing of them with sugar is accompanied with considerable difficulty, from the alcoholic extracts being generally very adhesive, and it is impossible, even with the greatest pains, to scrape the whole from the sides of the mortar and pestle employed, a difficulty which becomes greater when adhesive or resinous substances are added to them, such as *Sulphur. aurat. antim.*, *Calomel*, *Guaiacum*, and other powders; furthermore, as these extracts are usually administered in very small doses, and it must be of importance to the physician that the patient should receive accurately the quantity ordered, M. Gauger advises preparing mixtures of such extracts and sugar in the following manner, and keeping them on hand.

6 oz. of an alcoholic extract, fresh prepared in summer, are dissolved in a sufficiently large mortar of porcelain and glass pestle, the weight of which has been previously taken, in from  $\text{3i.}$ ,  $\text{3vi.}$  to  $\text{3ii.}$  alcohol of 0.815 to 0.793 spec. grav., and then  $2\frac{1}{2}$  lbs. of pulverized white sugar gradually added under constant stirring. When the whole has been properly mixed, a leaf of blotting-paper is tied round the mortar, which is then placed in a moderately warm situation to dry; the whole is then weighed, and so much powdered sugar added to it as is found requisite to bring the weight of the dried mixture to 3 lbs. In drying the mixture of the extract and sugar the alcohol evaporates, and carries with it the water which had remained in the extract, which renders the mixture so much the lighter. The preparation is now pulverized and passed through a fine hair-sieve. 6 grs. of the powder contain exactly 1 gr. of extract. It keeps exceedingly well in a dry situation, even when the air has access. Extract mixed with sugar in this manner may be dispensed very easily and quickly, and it may be readily mixed with other substances; it may moreover be kept for years in well-stoppered vessels and in a cool place without spoiling.

*Moschus* has, it is true, not the property of the alcoholic extracts of adhering to the vessels, but the mixing of it properly with sugar requires more time than the state of the patient or anxiety of friends generally allow. Furthermore, the physician is frequently obliged to prescribe very little sugar along with the *Moschus*, and the patient then obtains it from the shop as a doughy mass instead of being in the state of a powder.

For these reasons M. Gauger prepares a mixture of *Moschus* and sugar in a similar manner as for the extracts. 1 oz. of sorted musk is pulverized in a porcelain or glass mortar with 1 to  $1\frac{1}{2}$  oz. alcohol of 0.815 to 0.793 spec. grav. to a thick mass, and then 3 oz. of finely pulverized white sugar are gradually added under constant stirring. The moist, well-mixed powder is dried as above, weighed, and what is wanting to make up 4 oz. replaced by fresh sugar. After the whole has been again well mixed it is conveyed into a



stoppered bottle. 4 grs. of this powder contain exactly 1 gr. of *Moschus exvesicat.*

Such a powder may be dispensed very readily, and will surpass in accuracy any *ex tempore* mixture. It is moreover a well-known fact, that musk becomes finer by exposure to the air without becoming weaker, while that taken from the fresh pods, or preserved for any length of time in a moist state, has an offensive and ammoniacal odour. It may therefore be assumed that prepared in the above manner it increases in efficacy.

It is regarded as a sign of the goodness of the Tonquin musk pods that their contents should consist either entirely, or for the greater part, of rounded, smooth, or irregularly shaped, dark brown, nearly black, usually shining lumps or balls, of the size of a pin's head to that of a pea; for the preparation of the *Mosch. cum sacch.* such only should be employed, *i. e.* lumps entirely freed from hair, membranes and other foreign bodies.—Gauger's *Repertorium*, 1842, p. 653.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *Method of Silvering Cast Iron.* By Major JEWREINOFF.

THE combination of iron with carbon, cast iron, from the ease with which it melts, and the consequent possibility of taking the finest impressions of form, has come into very extensive application. The art of founding converts cast iron into enormous arches, columns, cannons, and also into the most delicate bracelets, ear-rings, &c. Unfortunately the moist atmosphere very soon alters the surface of these objects, and it is found necessary to coat them with paint, which gives the cast iron, the colour of which is itself not very attractive, the appearance of mourning. In the present state of the art of founding, cast iron might easily be substituted for bronze, were it not for its sombre appearance, which entirely excludes it. This disadvantage may however be entirely overcome, from the possibility of plating it with silver; in fact, cast iron may be readily silvered, and equally as well as copper and bronze. Some successful experiments which I have made on this subject induce me to give a short description of the method which I have employed. The liquid for silvering is prepared in the following manner:—Cyanide of potassium, prepared according to Liebig's method\*, is introduced into a stoppered vessel, and freshly-prepared pure chloride of silver, still in a moist state, added; the whole being covered with water and shaken violently for some time at the ordinary temperature. An excess of chloride of silver is taken, and should a small quantity of it remain undissolved, a few pieces more of the cyanide are added after some time, taking care however to avoid having an excess of the latter salt, but always a small quantity of undissolved chloride at the bottom of the vessel.

\* See this Journal, p. 526.



This last circumstance is important, because when the liquor contains too much free cyanide of potassium it is easily decomposed, and moreover does not silver so well; before employing it, it is filtered, and is thus rendered perfectly clear, iron and a little chloride of silver remaining on the filter. I effect the plating by means of a galvanic pair of plates, consisting of zinc and a coak cylinder, which are separated from each other by means of an earthen diaphragm. The pair are placed in a glass vessel containing dilute sulphuric acid, and dilute nitric acid is conveyed into the earthen diaphragm. Experience has shown me that the best mixture for the coak cylinders should consist of 5 parts by weight of finely pulverized coak, 8 parts pulverized coal, and 2 parts common rye flour. When the cylinders are dry they are placed in earthen crucibles, in the lids of which there is an aperture for the escape of the gases, and are then heated to redness.

Those cast iron objects may be most easily silvered which have not been painted, as the removal of the paint from the surface of the metal is somewhat difficult. The cleansed object is immersed in the silver solution, and connected with the zinc pole by means of a conducting wire, and a platinum plate immersed in the liquid at some distance from the object to be silvered, and connected with the coak cylinder. A plate of cast iron, of 4 square inches surface, is generally completely plated in thirty minutes.—*Bulletin de St. Petersbourg*.

#### *Preparation of a beautiful Green Colour without Arsenic.*

48 lbs. of sulphate of copper and 2 lbs. of bichromate of potash are dissolved in the requisite quantity of water, and 2 lbs. of carbonate of potash (pearlash) and 1 lb. of chalk added to the clear solution. The precipitate is pressed, dried and rubbed to a powder. This colour is not so beautiful as the Schweinfurth green, but is peculiarly well adapted for painting dwelling-rooms and work-shops, there being no fear of any poisoning from arsenic.

By varying the proportions a number of different tints of this colour may be obtained.—*Bittheilungen des Böhm. Gewerbevereins*, 1842, p. 733.

#### *Method of obtaining Chrome-Yellow without Sugar of Lead.* *By Prof. JUCH.*

As in the manufacture of chrome-yellow the whole of the acetic acid contained in the sugar of lead is lost, without its being possible to turn it to any account, the following process will probably be found much less expensive.

4 lbs. of finely-pounded pure white lead, and 1 lb. of bichromate of potash, are boiled, constantly stirring, with 20 lbs. of water, until decomposition ensues, which may be recognized by the supernatant liquor being no longer yellow but colourless.

A variety of tints may be produced by varying the proportions from 1 lb. of bichromate of potash to 14 lbs. white lead.



## REVIEWS.

*A Practical Manual, containing a Description of the General, Chemical and Microscopical Characters of the Blood, and Secretions of the Human Body, as well as of their Components, including both their Healthy and Diseased States; with the best Methods of separating and estimating their Ingredients; also, a succinct Account of the various Concretions occasionally found in the Body and forming Calculi.* By JOHN WILLIAM GRIFFITH, M.D., F.L.S., &c.

THE object of the author in presenting this pocket manual to the public is to supply those in the active practice of their profession with the means of readily ascertaining the states of the secretions, and referring them, on examining their relations, to the symptoms of disease. In it the matter is condensed into the smallest space consistent with its being thoroughly and readily applicable; but, at the same time, any curious points rendering it interesting are not omitted. It is thus hoped that the attention of practitioners generally will be roused to the subject, and the real nature of many morbid states more clearly made out.

## PATENTS.

*Patent granted to Francis Gybbon Spilsbury, Walsall, Staffordshire; Marie Françoise Catherine Dötzer Corbaux, Upper Norton Street, Middlesex; and Alexander Samuel Byrne, Montague Square, Middlesex, for Improvements in Paints or Pigments and Vehicles, and in Modes of applying Paints, Pigments and Vehicles.*

THIS invention consists in using soluble vehicles for applying paints or pigments, which vehicles, by an after application of chemical agents or reagents, are rendered insoluble in water, and thus allow of paints or pigments, so applied and so fixed, being afterwards washed with water or soap and water, in order to clean them; and this invention will at the same time admit of paints or pigments, and vehicles so employed, being applied for the most elegant purposes of house and such like painting, and also to the purposes of the artist, and for printing paper and other fabrics; and at the same time they will not emit that disagreeable smell consequent on using oils or spirits, or varnishes, produced therewith, combined with paints or pigments.

In painting there are few colouring matters or pigments which are used alone, but they are generally employed as colouring substances to what may be called a body pigment; and in most instances white lead (carbonate of lead) is used when oils, or spirits or varnishes prepared with them are the vehicles, and the coloured pigments are mixed therewith in order to produce the colour or tint



of colour desired. Hence, in any mode of compounding pigments for the purposes of being applied as paint, it is important to have a good and cheap white pigment which can be obtained in large quantities; and for such purposes, sulphate of lime, sulphate of barytes, argillaceous earths, or other white pigments (which should be free from iron) may be used.

It is well known that many chemical agents or reagents, when brought in contact with gelatine or with albumen in solution, coagulate them, and such coagulated substances when dry are insoluble. This is the case with other matters, hereafter described, which are employed (as well as gelatine and albumen) as the soluble vehicles for mixing with pigments, in order to their being used as paints; and by the subsequent application of chemical agents or reagents such vehicles are rendered insoluble, and the paints or pigments are fixed or set.

When gelatine is used as the soluble vehicle, alum is employed (by preference) as the fixing medium; and it should be stated, that as most of the paints or pigments will be found to be more or less acted on by the chemical agent or reagent employed for fixing or rendering the soluble vehicle insoluble, it is important that the pigment (previous to being mixed with the vehicle employed) should be subjected to the action of the chemical agent, which is to be afterwards used in fixing the vehicle or paint. Thus supposing the pigment intended to be used be an earth and the chemical agent alum, then the earth is submitted to the action of alum by mixing and washing it with a cold saturated solution of that substance, in order subsequently, by repeated washings, to remove the undecomposed alum therefrom; it will then be in a proper state to be ground up with the gelatine and water.

Small pug mills are employed for the purpose of mixing, and if for immediate use it must be reduced to the proper consistence with soft water, and then laid on to the surface or surfaces in like manner to ordinary paints, each coat being allowed to dry before another is laid on. When one, two or more coats have been applied, according to the desire of the painter, and become dry, the same are to be fixed by applying a cold saturated solution of alum, or such other chemical agent as may have been determined on; by this means the paint on the surface will be fixed and insoluble in water. It is only requisite to remark, that in using coloured pigments they also should be first treated with the alum or chemical agent to be employed in fixing the vehicle, as above described, in order to prevent any prejudicial action taking place in respect to the colour and to the pigment itself, which in many instances would be the case should such pigments be used without preparation, and subsequently brought in contact with the chemical agent used to fix the paint.

Albumen may be used in place of gelatine or in conjunction therewith; and the use of albumen is recommended for the purposes of the artist where the cost will not be considered an object; but for general purposes gelatine is preferred, in consequence of its being less expensive.



The method of preparing paints or pigments which are required to be kept for a considerable time is as follows:—To make white paint, take 160 lbs. of sulphate of lime or sulphate of barytes, or white earth, well washed, in order to separate all foreign matters, as is well understood, and which has been treated with the chemical agent, as above explained; mix therewith about 20 lbs. of solid gelatine and about 14 lbs. of sulphate of zinc (any other suitable material for preserving the gelatine from decomposition may be used) dissolved in 160 lbs. of warm water. This compound is made into a very thick paste, and packed in small casks; or the compound may be dried with or without sulphate of zinc, or other preservative; or the dry pigment may be prepared or mixed with dry gelatine or albumen.

It should be stated that the means of preserving gelatine heretofore most generally adopted, namely by the employment of sulphurous acid, acetic acid and alum, are not proper for the purpose of this invention those materials which the patentees prefer using are sulphate of zinc, or other soluble salts of zinc, the soluble salts of magnesia, or the soluble salts of lead.

When the pigment is to be tinted or coloured, the white pigment employed is to have coloured pigments combined or intimately mixed therewith, in order to produce the tint of colour desired, unless the coloured pigments are to be employed by themselves, which is seldom the case in colouring or painting; and such coloured pigments are to be first treated with a cold saturated solution of alum or other material, which is intended to be afterwards employed in fixing the soluble vehicle by rendering it insoluble.

Another part of this invention relates to a like mode of employing other soluble vehicles for pigments, in which the vehicles are to be afterwards rendered insoluble by alum or other known chemical reagents; these vehicles are formed by dissolving resinous matters in a solution of borax or in an alkaline ley, and by dissolving wax in an alkaline ley.

The first kind of vehicle is made by combining well-bleached shell-lac and borax together in the proportion of about 5 lbs. of the former to 1 of the latter, and boiling them in about 4 gallons of water until dissolved. The pigments are ground with this vehicle to the proper consistency of paint, and are laid on in the usual way; when dry they are washed over with a solution of alum, or other chemical agent, which is known to destroy the combination of the lac and borax and render the lac insoluble.

The second kind of vehicle is produced by mixing equal parts by weight of white wax and caustic soda leys of specific gravity 1.04, and boiling the mixture for several hours, adding half a gallon of water to every pound of wax after the solution is effected. It is also preferred to add 4 lbs. of dried starch, calcined or uncalcined, to each pound of wax. To this vehicle is to be added as much of such pigments which, by previous test, are not acted upon prejudicially by an alkaline solution, as will bring it to the consistence of honey, and the mixture is reduced to a proper state for painting by



the addition of soft water. When the surface painted with the mixture or pigment is dry, it is washed over with a solution of alum, or any other chemical agent that will destroy the combination of wax and alkali, leaving the wax insoluble in water. It is obvious that the above vehicles may be used in combination with each other, as well as separately.

Another mode of employing gelatine, and the other vehicles described for fixing paints or pigments, is to apply a coating of either of the vehicles over a painted or printed surface, and afterwards fix the vehicles by a chemical solution, as above described; by this means paints or pigments may be set without the necessity of combining the above-mentioned vehicles with them previous to use. In some cases the sulphate of zinc or other preservative material is mixed with the pigments, as described above, but without any vehicle, which is supplied by the painter previous to using the pigments. The object of this mode is to enable the mixture with gelatine, when made, to keep a reasonable time in hot weather, and at the same time that, by their not being mixed till wanted, the pigments may be kept an unlimited time. This mode of preparation is particularly applicable for hot climates.

When the pigments and vehicles, prepared as hereinbefore described, are used for printing and painting paper and other fabrics, as well as other surfaces, a small quantity of dissolved starch should be added to the solution of alum employed as the fixing material, by which means the solution will be caused to work better, and will not be liable to run when laying it on.

The last part of this invention consists in employing certain vegetable matters in the preparations and application of paints or pigments. For this purpose the glutinous or adhesive products of vegetable matters generally will do, but gluten, albumen, gums and mucilage are preferred, using them either separate or in combination with other products usually found therewith; for example, a mixture of flour and water is made in such proportions, that when boiled it will be about the consistence of cream; and with this mixture the pigment is ground to the state of paint, with or without sulphate of zinc or other preservative. This paint or pigment, if necessary, is reduced with water, and is then laid on in the usual manner; and when dry it is fixed by the application of a suitable chemical agent or reagent, such as silicate of potash or soda, commonly called liquor of flint.

Another mode of carrying out this part of the invention consists in mixing any quantity of dissolved tragacanth, of the consistence of linseed oil, with as strong a solution of silicate of potash or soda as will not injure the colour which is to be employed. With this mixture the paint or pigment is brought to a proper consistence for working, and then applied in the usual way to surfaces, and when thoroughly dry it will be insoluble in water.—Sealed October 7, 1839.



*Patent granted to William Newton, Chancery Lane, for an improved Medical Compound or Ferruginous Preparation, to give Tone and Vigour to the Human System, particularly applicable in Cases of Weak Digestion and in the Diseases called "Chlorosis."*

This improved medicinal compound is a mixture or combination of ferruginous preparations with farinaceous matters, intended to be taken into the stomach by way of food in the form of bread, biscuits or cakes.

The invention, as communicated to the patentee by M. de Herpyon of Paris, is directed to be carried into effect by the following means:—A given quantity of ferruginous preparation (say of the soluble salts of iron) is to be dissolved in a suitable quantity of water, and this water, so impregnated with the iron, is to be employed as the menstruum or liquid for mixing up a given quantity of flour into dough. The proportions of the iron to the flour must be according to the complaint, disease or physical state of the patient, and may be regulated by the advice of the physician or other medical attendant. The dough, so prepared, having been properly kneaded, is to be baked into bread, biscuits, cakes or other suitable forms, and is then fit to be eaten by the patient as an ordinary article of food, as part of his or her daily aliment. By such administration of the iron in small quantities the constitution of the patient will be gradually restored to its natural tone of health and vigour, and in a much more effective and agreeable manner than if taken in doses by the ordinary means of solution, or by other modes.

This medicinal compound, when made up in the form of biscuits, may be readily carried and used at sea or upon a journey as an article of food, and may be continually taken by persons suffering under the complaints above alluded to. In hospitals, and in the army and navy, under circumstances of extensive prevailing disorders among the men, such as scurvy, this mode of introducing iron and other suitable medicines into bread or biscuits, subject to the direction of the medical adviser, will be found to be extremely convenient and efficacious; and the materials may be so mixed that the patients shall not be aware of the bread which they are eating being medicated.

The proportionate quantities of the preparations, to be mixed with the flour employed for making the bread, should be regulated, as above mentioned, by the advice of a medical man, as it is impossible to give any definite directions; for in all cases the quantities must depend upon the state or character of the disease to be combated, and of the particular preparations of iron and other matters employed to arrest the disease or to restore the constitution to health and vigour.—Sealed June 12, 1839.



# THE CHEMICAL GAZETTE.

No. XXII.—September 15, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*Examination of the "Vinegar-Mother," or Ferment (Mycoderma aceti). By M. MULDER.*

It is self-evident that the origin of organized beings from non-organized substance must depend on a change of matter. Investigations for the purpose of explaining this point must evidently proceed from the most simple case. Such a case is the formation of the so-called vinegar-mother, a plant which originates in the vinegar, and in fact at the sole expense of the constituents of the vinegar. This cryptogamous vegetable belongs to the genus *Mycoderma*, Pers., or *Hygrocrocis*, Ag. It may justly be regarded as one of the most simple vegetable formations, and belongs rather to the Fungi than to the Algæ. Fruit-bearing organs with globular sporidia could never be detected in this species which grows in the vinegar (*Mycoderma vini* and *Mycoderma cerevisiæ*, which probably constitute one species). It does not originate in wood-vinegar, but always in wine-vinegar, and also in beer-vinegar, causing entire vats of it to pass into water. It is also often found in vinegar in which organic substances have been preserved. These substances however contribute nothing to the development of the mould plant; they only further the origin of a germ, a cell, which separates from the mass, and now as a germ forms a plant from the elements of the acetic acid. From wine-vinegar, in which totally different substances have been preserved, or in which nothing had been preserved, the very same species of *Mycoderma* was developed, the same organized structure, the same mould plant, identical in form and in chemical composition.

The principal constituents of the wine-vinegars are acetic acid,  $C^4 H^3 O^3$ , and water. They contain also some salts, a small quantity of sugar, gum and extractive substance, and above all some proteine derived from the albumen of the grapes dissolved in the acetic acid. In vinegar in which vegetable substances, for instance gherkins, cherries, &c. have been preserved, the quantity of the proteine may be increased from these vegetables; but that this is not requisite is evident from the formation of the vinegar-mother in pure



wine or beer-vinegar. The aliments of this vegetable mould are therefore  $C^4 H^3 O^3$ ,  $HO$  and  $C^{40} H^{31} N^5 O^{12}$ .

Now these constituents are found to be grouped in a very simple manner in the plant, while both proteine and acetic acid disappear from the liquid. The plant moreover contains nothing else, and we are therefore able to follow chemically the transformation of acetic acid and proteine into a plant.

It is not less remarkable that the plant has always the same chemical composition, and the organization therefore requires a definite proportion of acetic acid and proteine, the latter of which remains unaltered, while the first forms cellular substance under absorption of water. The new product of the acetic acid combines in atomic proportions with the proteine; the organization requires therefore chemical proportions just as well as the formation of gypsum from carbonate of lime and sulphuric acid.

The vegetable mould examined by Mulder was taken from vinegar in which some substances had been preserved. Although always wine-vinegar, the samples were of various origin; currants were preserved in No. I., cucumbers in No. II., and gherkins in No. III. In the latter it formed very rapidly; the first traces of it were observed five days after placing the substances in the vinegar; on removing the first crust, the second formed in the course of a week, and so on for the five following weeks, always a new one, although the vessel was well closed. The strength of the acetic acid decreased more and more, until at last nothing but water remained. All these crusts were possessed of the same properties.

The species of *Mycoderma* examined always formed a coriaceous membrane, more or less elastic, saturated with vinegar, and of a white colour, except that from the vinegar of the currants, which was reddish. By kneading and pressing the membrane, it was obtained perfectly white and pure; on drying it shrinks somewhat, and forms a membrane void of taste and smell. Neither water nor alcohol dissolves anything from it by boiling. On incineration it does not leave the slightest trace of ash. Submitted to dry distillation, it affords much coal, and an acid liquid distils over, from which potash liberates ammonia.

It is not affected by concentrated sulphuric acid at the ordinary temperature, but on warming it becomes first red, then under decomposition of the sulphuric acid brown, and at last black. Strong nitric acid colours it somewhat yellow, and on the application of heat it dissolves very slowly in it; hydrochloric acid has no perceptible action upon it; strong acetic acid takes up at a boiling temperature some proteine, the presence of which can be demonstrated by the yellow prussiate of potash. Strong solution of caustic potash disengages some ammonia; a dilute solution dissolves some of the proteine, which can be again precipitated by an acid. By long digestion with potash and continued boiling with hydrate of acetic acid, the whole of the proteine may be extracted, and pure cellulose remains behind.

When well purified by means of water and alcohol, it ceases to



lose any more in weight at from  $248^{\circ}$  to  $275^{\circ}$  F. The analysis of the three different kinds above mentioned gave—

	I.	II.	III.	Atoms.	Calculated.
Carbon . . . . .	46.75	46.89	46.89	136	46.60
Hydrogen . . . . .	6.51	6.52	6.50	230	6.40
Nitrogen . . . . .			3.87	10	3.96
Oxygen . . . . .			42.74	96	43.00

The cellulose which remains behind when all the proteine has been extracted by potash, is not combined with any other body. This cellulose, which was examined by Payen, has (which was confirmed by a repetition of his experiments) the formula  $C^{24} H^{21} O^{21}$ , or that of the solid modification of inuline. The *Mycoderma* may therefore, in as far as it consists of cellulose and proteine, be expressed by a formula. The above formula corresponds to 1 equivalent proteine and 4 equivalents cellulose:—

	Carbon.	Hydrogen.	Nitrogen.	Oxygen.
1 equivalent proteine . .	= 40	62	10	12
4 equivalents cellulose . .	= 96	168		84
	136	230	10	96

If we now follow the mode of formation of the plant from the vinegar, the first thing we observe is that the proteine which was present in the vinegar as albumen from the grape, passes from the dissolved state into a solid, at the same time assuming an organic form. On employing wood-vinegar the proteine must be furnished by the vegetable substances which had been preserved in it; but, as above mentioned, pure wine-vinegar also produces vinegar-mother; the cellulose therefore can have originated solely from the acetic acid, and in fact  $6 C^4 H^3 O^3 + 3 HO = C^{24} H^{21} O^{21}$ . This return of the acetic acid into the organized form is highly remarkable, in so far as it seems to prove that the substances which serve as nutriment to plants need not necessarily be first decomposed into water, carbonic acid and ammonia.—*Ann. der Chem. und Pharm.*, xlvi. p. 207.

*On the Presence of the Sulphate of Tin in the Sulphuric Acid of Commerce. By M. DUPASQUIER.*

It is generally known that the sulphuric acids of commerce contain lead, iron, and frequently arsenic; but I am not aware that the existence of tin in them has hitherto been noticed. Nevertheless this metal may be obtained, and in somewhat considerable quantity, from most of the commercial acids; and it will not be useless to be aware of this circumstance, which may have some influence in many operations, especially in those of dyeing, which should be taken into consideration.

I found sulphate of tin in all the acids which I examined while engaged in the researches which I have published on the arseniferous sulphuric acids in the following manner:—In order to precipitate the arsenic of these acids, I diluted them with twice or six



times their weight of water, and passed a current of sulphuretted hydrogen through them, which gave rise to a yellowish-brown precipitate when the acid contained arsenic; this precipitate was less considerable, and of a darker brown when the acid was not arseniferous.

Thinking that sulphuret of lead might have been formed, and that the brown colouring of the sulphuret of arsenic should be attributed to that compound, I treated the precipitates obtained by the action of sulphuretted hydrogen on the sulphuric acids with nitric acid, and I constantly obtained a white residue, insoluble in water, soluble in *aqua regia*, which solution presented all the characters of the nitro-muriate of tin. With respect to the solution effected by the nitric acid, I found it to be arsenic acid when this sulphuret of tin was mixed with the sulphuret of arsenic. I could never detect a trace of lead, which circumstance will be accounted for in a subsequent notice.

Having always found sulphate of tin in the sulphuric acids submitted to examination, I questioned myself as to its origin, and I soon ascertained that it was simply due to the action which the acid has on the solder of the leaden chambers. Now it is well known that the soldered portions are very rapidly corroded by the acid vapour with which they are in constant contact.

The presence of tin in the sulphuric acid of commerce accounts for the traces of this metal which have sometimes been found in the green vitriol of commerce.—*Journ. de Pharm.* for August.

*On a remarkable Chemical Metamorphosis of Mannite and of Glycerine. By J. W. DÖEBEREINER.*

The composition of glycerine and of mannite may be expressed by formulæ which call to mind their saccharine nature, and at the same time the chemical constitution of cane-sugar and of grape-sugar, by representing the former as hydrogenated cane-sugar,  $C^6 H^5 O^5 + 2H = C^6 H^7 O^5$ , and the latter as hydrogenated grape-sugar,  $C^6 H^6 O^6 + H = C^6 H^7 O^6$ .

As mannite is produced in considerable quantity during the spontaneous fermentation of the juices of the beet-root and carrot, I was inclined to consider this representation of its composition as a truth; I accordingly took occasion to ascertain whether this body might be dehydrogenated and converted into fermentable sugar. With this view I acted on some mannite dissolved in the least possible amount of water with oxyphoric platinum and the atmosphere, and on another portion with peroxide of lead. The mannite was metamorphosed by both these agents, by the first at a temperature of from  $104^\circ$  to  $122^\circ$  Fahr., by the latter at a temperature between  $194^\circ$  and  $205^\circ$  Fahr., not into a sugar, but into some other substance. The former converted it into an acid resembling gum, of a yellow colour, soluble in water, but insoluble in alcohol; the latter into a substance of the nature of acetylene, carbonic acid, formic acid and gum.



Oxyphoric platinum has a far more remarkable action on glycerine than on mannite. When these two bodies are mixed with each other a reaction immediately ensues, which is perceptible both to the touch and to the smell; in fact the mixture becomes very much heated, absorbs a large quantity of oxygen from the atmosphere, and then gives off a vapour of a peculiar odour, slightly acid, reddening litmus paper, which condenses very readily, but the quantity of which is so small that it is impossible to collect it for examination. When the action has terminated the glycerine is found, mixed with the platinum, converted into an acid, which is neither volatile nor crystallizable, but which, after the evaporation of its solution in water, is obtained in the form of a syrup; it has an acid acrid taste, is soluble in alcohol, and possesses the property of reducing the oxide of silver and the protoxide of mercury dissolved in nitric acid when heated with these bodies. I was first inclined to regard this acid (glycerinic or glycerilic) as malic or lactic acid; but I subsequently found it to be distinguished more or less from these two acids by its action on the basic oxides.

Since glycerine behaves in the same manner as alcohol towards platinum, and likewise possesses the property of forming with sulphuric acid a combination similar to the sulphovinic acid, it may be considered in this respect *analogous to alcohol or amylol*, &c.; and if such be the case, it may be admitted that in its oxidation or acidification (by the platinum) it absorbs, like every species of alcohol, 4 equivalents of oxygen, with which it would form 3 equivalents water and 1 equivalent of an acid =  $C^6 H^4 O^6$ , as  $C^6 H^7 O^5 + 4O = 3HO + C^6 H^4 O^6$  \*. At the present moment I have not sufficient glycerine at my disposal to verify the correctness of this opinion and to continue the investigations, and I therefore beg the reader to consider the present notice merely as a *prendre date* of the French.

N.B. By oxyphoric platinum is meant not platinum sponge but the preparation previously known under the name of *æthiops of platinum*, or *platinum black*, which I found to absorb oxygen with greater force.—*Journ. de Pharm.* for August.

### *On the Oxidizing Action of Chlorate of Potash on Neutral Substances.*

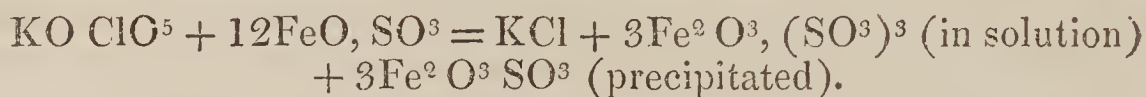
M. Barreswill has communicated to the 'Journal de Pharmacie' for August a very interesting fact which he had occasion to observe in conjunction with M. Köchlin, while investigating the mode of action of the chlorate of potash as an oxidizing agent.

When a hot solution of this salt is mixed with a solution of the protosulphate of iron, likewise hot, the two perfectly-transparent liquids immediately become turbid, and exhibit in suspension a considerable red precipitate. The filtered liquor is also of a red colour.

\* An acid of this nature might be considered as a combination of formic acid,  $C^2 H O^3$ , and of acetic acid,  $C^4 H^3 O^3$  for  $C^2 H O^3 + C^4 H^3 O^3 = C^6 H^4 O^6$ .



The reaction is one of the most simple and most precise that can be imagined; the chlorate of potash loses the whole of its oxygen, which goes entirely to the protosulphate of iron, causing this to pass into the state of the persulphate, in part neutral salt and in part basic, without any perchlorate being formed:—



The same reaction takes place in the cold, but more slowly. At the boiling temperature it is complicated, from the action of the neutral sulphate of the peroxide of iron on the chlorate of potash, which may be compared to that of sulphuric acid; for, in fact, the neutral sulphate is converted into the subsulphate, and the two equivalents of acid react on the chlorate of potash. The subsulphate deposited from a hot solution is yellow, anhydrous, and dissolves with difficulty in acids, while the subsalt which subsides from a cold solution is red, hydrated, and is very soluble in dilute acids. All the neutral salts of the protoxide of iron behave in a similar manner, which indeed is the case with all neutral substances susceptible of oxidation by exposure to the atmosphere; the chlorate of potash abandons the whole of its oxygen to them.

Iron and zinc become oxidized in a solution of the chlorate, and soon the liquid contains chloride only; the action, which is somewhat energetic, is singularly diminished by the layer of oxide which forms and protects the metal.

Lead does not oxidize under the same circumstances, but if placed at the same time in contact with water, chlorate and carbonic acid, without the air having access, it is gradually converted into white lead, a fact which very much confirms M. Pelouze's theory of the formation of this compound.

A solution of chlorate of potash in water is therefore a powerful oxidizing agent for neutral substances, abandoning both the oxygen of its acid and that of its base. Its action may be compared to that of air or weakly oxygenated water. This property will without doubt find numerous applications.—*Journ. de Pharm.* for August.

*Occurrence of Phosphate of Lime (Apatite) in Meteoric Stone.* By C. U. SHEPARD, M.D., Prof. of Chemistry in the Medical College of the State of South Carolina.

M. Rumler, in a recent number of Poggendorff, in enumerating certain ingredients in meteorites, after the mention of phosphoric acid, adds, "Shepard's discovery of this acid in the meteoric stone of Richmond is still doubtful." Although this observation occasioned in me no surprise, since I had stated at the conclusion of my remarks on the mineral, my regret "that the smallness of the quantity prevented me from making still further experiments, by means of which my conclusion concerning its nature might have been rendered certain," still it determined me to make new trials for placing the subject, if possible, beyond dispute.



Through the kindness of Professor Silliman, who possesses nearly the whole of the Richmond stone, I was permitted to detach a fresh fragment, which brought into view several points of the yellow mineral in question. The most perfect of these, having the size of half of a pin's head, was crushed to powder on a small piece of clean platinum foil, previously fitted to the bottom of an agate mortar. The foil, with the crushed mineral thereon, was then shaped into a little cup, and a freshly-cut piece of potassium pressed into it, so as to be in immediate contact with the powder. The platinum cup and its contents were then forced to the bottom of a test tube ( $\frac{1}{4}$  of an inch in diameter and  $2\frac{1}{2}$  inches long); and after heating the tube in contact with a live coal, until a slight flash of light was witnessed in the platinum cup, a few drops of water were let fall into the tube. On holding the open end of the tube beneath the nose, a distinct odour of phosphuretted hydrogen was recognized. A few drops of dilute nitric acid were subsequently added; and after digestion for a few moments and neutralization by ammonia, oxalate of ammonia threw down an evident precipitate.

The foregoing experiment clearly establishes the presence of phosphoric acid in the mineral; and the precipitate with oxalate of ammonia, taken with all the circumstances detailed in my mineralogical account of the substance, leave scarcely a doubt of its being combined with lime in the form of phosphate of lime.—Silliman's *Journal* for July 1843.

#### *Formation of Salicine.*

M. Piria has found salicine to be a combination of sugar with another body, saligenine. They may be separated by placing salicine for some time in contact with synaptase, and then treating the mixture with æther, which takes up the saligenine while the sugar remains in the water. On the spontaneous evaporation of the æther, the saligenine is left behind in large prisms having a nacreous lustre, which are reddened by sulphuric acid, are converted by dilute acid and the assistance of heat into salicetine, by nitric acid into the protohydrate of salicyle and carbazotic or pikronitric acid, and afford an indigo-blue colour with salts of the oxide of iron.—*L'Institut*, No. 500.

#### *On the Atomic Weight of Calcium, Strontium and Barium.*

*By* M. SALVETAT.

The author concludes from some experiments, an account of which he promises to bring before the French Academy at some future time,—1st, that the atomic weight of calcium should be fixed at 250 grms., as found by MM. Dumas, Baup, and Erdmann and Marchand, *i.e.* the molecule of hydrogen being 1, that of calcium will be represented by 20; 2nd, that the atomic weight of strontium should be fixed at 550 instead of 547.29, *i.e.* hydrogen being 1, that of strontium will be 44; 3rd, and lastly, that the atomic



weight of barium should be fixed at 850 instead of 856·88, or the molecule of hydrogen being taken as unity that of barium will be 68.

These results were obtained from very simple experiments, executed on a large scale, in which never less than 3 grms. of substance were employed, chemically pure, and prepared with the greatest care.

In the case of carbonate of strontia two different processes were followed,—determination of the loss in weight of a known quantity of substance by long-continued calcination, and determination of the loss in weight of a known quantity of substance, treated with a fixed weight of sulphuric acid in a suitably-arranged apparatus. For the carbonate of barytes this latter method only was employed, but the author, judging from a successful experiment made on a small scale, hopes to succeed in expelling the whole of the carbonic acid by calcination, at a high and long-continued temperature, in the porcelain furnaces of the Sevres manufactory.

To the list, already numerous, of bodies the atomic weight of which is found to be a multiple of hydrogen, should therefore be added barium and strontium, if these simple experiments, which may be easily repeated, are confirmed.

The author directs attention to the termination 50 being common to three bodies, which exhibit great analogy in their chemical properties, without however wishing to attach any importance to this circumstance at present, viz.—

Calcium . . . . .	250
Strontium . . . . .	550
Barium . . . . .	850

*Comptes Rendus*, Aug. 14.

*On the Action of Sulphuric Acid on Acetic Acid. By M. MELSENS.*

The following investigations were undertaken by the author with a view to confirm certain theoretical ideas concerning the constitution of some organic acids. M. Dumas, founding his argument on the fact discovered by M. Mitscherlich, that sulpho-benzoic acid saturates 2 equivalents of base, has attributed the polybasicity of tartaric, citric acids, &c. to these acids being complex bodies formed, like the sulpho-benzoic acid, by the union of two or more acids, each of which would saturate on its own account one or several equivalents of base. According to this view tartaric acid should be regarded as formed of oxalic acid and of acetic acid, just as the sulpho-benzoic acid is formed of sulphuric and benzoic acids, so modified however that it will have lost 1 equivalent of hydrogen, and will have acquired in its place 1 equivalent of sulphurous acid. Setting out from this point of view, M. Melsens sought to ascertain whether by treating acetic acid with sulphuric acid there would be produced a conjugated acid, which would bear the same relation to acetic acid as the sulpho-benzoic to benzoic acid. He also demanded whether



his complex acid produced would not possess the properties of tartaric acid, for in his opinion tartaric acid being represented by oxalic and acetic acids, the new body should be the same tartaric acid in which the oxalic acid was replaced by sulphuric acid. The authors of this report (MM. Stas and Hemptinne) admit the existence of a perfect analogy between the acid discovered by Mitscherlich and the one in question; and also the property possessed by both these complex acids of saturating at least 2 equivalents of base being due to their being formed of two acids; but they doubt the correctness of M. Melsens' conclusion with respect to the placing of sulphacetic acid by the side of tartaric acid, and the polybasicity of the latter being attributable to its being formed of two organic acids. They incline to admit the existence of integrant molecules in tartaric and citric acids, which under the influence of the oxygen of certain metallic oxides would lose hydrogen in the state of water, and would acquire equivalent quantities of metal. The discovery of the organic chromacids made by M. Malaguti renders this view probable.

The principal fact in M. Melsens' researches is the discovery of a complex acid resulting from the action of anhydrous sulphuric acid upon pure acetic acid. When, according to the author, anhydrous sulphuric acid is gradually added to acetic acid, all odour of vinegar disappears at a certain period, and a liquid mass is obtained, which is colourless or slightly yellow. If it be let fall in drops into water at 32° Fahr., sulphuric and acetic acids are reproduced, showing that the pure and simple union of those two acids is destroyed by water. But if, instead of conveying this mass into water, it be previously exposed for several days to a temperature of 140° to 167° Fahr., the two acids no longer separate on being mixed with water; this liquid, on the contrary, holds a complex acid in solution, which, saturated by carbonate of barytes or carbonate of lead, affords soluble salts of these bodies, differing entirely from the acetates of these bases. On decomposing the lead salt, previously purified from any foreign matter, with sulphuretted hydrogen, an acid is obtained, to which the author has applied the name of sulphacetic acid. In its pure state it possesses the following properties:—It is solid, and crystallizes in silky needles; it attracts moisture with such avidity as to render its analysis extremely difficult; it dissolves in water and in alcohol. The aqueous solution does not precipitate salts of lime, of lead or of silver. When concentrated as much as possible it precipitates chloride of barium, but the precipitate is soluble in water.

This acid combines with oxides and forms well-defined salts. The extraordinary affinity of this substance for water rendered the determination of the amount of water extremely difficult, sometimes even impossible. The following results were obtained for the crystallized acid :—

	I.	II.	III.
Carbon . . . . .	14·87	14·28	14·48
Hydrogen . . . . .	4·80	4·98	4·15
Sulphur . . . . .	18·56		18·81



For the acid which had effloresced in vacuum—

Carbon .....	14.99
Hydrogen .....	3.69
Oxygen .....	19.77

The author deduces from these analyses the following formulæ:—

For the crystallized acid ....  $C^3 H^2 O^3, S^2 O^5, 2HO + 3 aq.$

For the effloresced acid .....  $C^3 H^2 O^3, S^2 O^5, 2HO + 2 aq.$

The author, guided by M. Dumas's law of substitutions, does not write the formulæ in the above manner. He assumes that the sulphur exists in this body half in the state of sulphurous acid and the other half as sulphuric acid; he moreover supposes that the sulphurous acid is substituted for the hydrogen of which the acetic acid has been deprived. This mode of conception is not admitted by all chemists, and among others by M. Berzelius. It appears to us however that the existence of sulphobenzine,  $C^{24} H^5 SO^2$ , and of sulphobenzinic acid, renders this view more than probable.

All the analytical results clearly show that the sulphacetic acid saturates 2 equivalents of base, and that the anhydrous sulphacetates should be represented by the formula  $C^8 H^2 O^3, S^2 O^5, 2RO$ .

The author has not confined himself to the analysis of the salts in the anhydrous state, but he has also determined the amount of their water of crystallization; thus the salt of potash was found to contain 2 equivalents of water of crystallization, that of barytes 2 or 3, according to whether it crystallizes from a hot or cold solution; the lead and silver salts likewise contain 2 equivalents of water of crystallization.

It has been stated above that the sulphacetic acid was a bibasic acid; if the least doubt remained on this point, it would be entirely removed by the discovery made by the author of the sulphacetovinate of silver. On passing a current of hydrochloric acid through absolute alcohol containing sulphacetate of silver in suspension, a new acid is produced by the union of the sulphacetic acid and the æther analogous to the tartrovinic acid. On saturating this acid with oxide of silver the new salt in question is obtained. The analyses of this salt lead to the formula  $C^3 H^2 O^3, S^2 O^5, C^3 H^5 O, AgO$ . We have therefore in this case, as in the tartrovيناتes, an equivalent of æther or of oxide of æthyle substituted for 1 equivalent of metallic oxide, a fact which is opposed to the hypothesis of this acid being monobasic.

Besides the bodies above described, the existence of which appears to be well established, the author inclines to believe that the sulphacetic acid undergoes successive modifications under the influence of sulphuric acid; the analysis of a silver salt thus obtained led him to suspect that the sulphuric acid, after having removed hydrogen from the acetic acid, and replaced this hydrogen by sulphurous acid, attacks the carbon, as proved by M. Walter with respect to the sulpho-camphoric acid, and thus gives origin to products in which oxygenated combinations of sulphur replace the carbon and hydrogen.—*Report made by MM. Stas and Hemptinne to the Academy of Bruxelles, as inserted in the Journ. de Pharm. for August.*



*Analysis of the Phosphates of Lead.*

M. Winckler has examined all three phosphates of lead. They were prepared by precipitating nitrate of lead with the corresponding phosphates of soda, viz. with crystallized phosphate of soda, with ignited, redissolved, and again crystallized pyrophosphate of soda, and with metaphosphate of soda, which had been obtained by adding to a concentrated aqueous solution of 548.41 grs. crystallized phosphate of soda 480 grs. phosphoric acid (= 109.18 grs. anhydrous phosphoric acid), evaporating, igniting, dissolving the residue in water, and allowing to crystallize. The analyses afforded in 100 parts—

	Metaphosphate.	Pyrophosphate.	Phosphate.
Oxide of lead . . . . .	61.017	74.664	80.235
Phosphoric acid . . . .	38.983	25.336	19.765

So that the three phosphates of lead correspond entirely with the silver salts.—*Jahrb. für Prakt. Pharm.*, v. p. 304.

## ANALYTICAL CHEMISTRY.

*On the Detection of Arsenic in Medico-Legal Researches by Reinsch's Test.* By ROBERT CHRISTISON, M.D., Professor of Materia Medica in the University of Edinburgh.

IT is now generally known in this country, that towards the close of last year Professor Reinsch proposed an entirely new method of detecting arsenic; which consists in acidulating any suspected fluid with hydrochloric acid, heating in it a thin plate of bright copper, upon which the arsenic is deposited in the form of a thin metallic crust, and then separating the arsenic from the copper in the state of oxide by subjecting the copper to a low red heat in a glass tube. Organic fluids and solids, suspected to contain arsenic, may be prepared for this process by boiling them for half an hour with a little hydrochloric acid; solid matters being cut into small shreds, water being added in sufficient quantity to let the ebullition go on quietly, and care being taken to continue the boiling until the solids are either dissolved, as generally happens, or are reduced to a state of minute division.

Nothing can be more simple, easy or precise than the method of Reinsch. It is also exceedingly delicate, more so than is ever likely to be necessary in any medico-legal investigation; for it is adequate to detect a 250,000th part of arsenic in a fluid. It is also perfect in another respect: it does not leave any arsenic in the subject of analysis; none, at least, which can be detected by any other means, even by the most delicate process yet proposed, that of Mr. Marsh.

My object in briefly calling the attention of professional persons to the subject at present, is to mention the results of its application



to two medico-legal cases in which I have lately employed it, and to state one or two circumstances which ought to be kept in view in order to give it its full value, as the means of furnishing irrefragable evidence in criminal inquiries.

Reinsch's test, as it is often called, is not to be regarded as in strict language a test adequate to prove the existence of arsenic. Chemistry requires no new test for determining the nature of arsenic when once it has been detached by itself for examination. It is true that the separation of arsenic upon copper, from a state of solution, by means of hydrochloric acid and heat, is a new fact in chemistry; and the experiment furnishes a test so far, that if the copper be not tarnished arsenic cannot be present. But though Reinsch's discovery thus supplies a prompt and certain negative test, it cannot be regarded as a positive one when the copper does acquire a metallic coating; because, as he himself has pointed out, bismuth, tin, zinc, and above all antimony, will in the same circumstances yield a coating to copper, different indeed in some degree from that formed by arsenic, yet sufficiently similar to render it absolutely necessary that the deposit be examined otherwise than by ocular inspection only. Reinsch's process however is of far greater value than if it had merely presented chemical science with a new test for arsenic. It constitutes the simplest, easiest, and most secure mode of separating arsenic from the most complex states of mixture, in such a condition as to enable the experimentalist to apply to the metal with great facility any of the characteristic tests already known.

The question then is, having thus an admirable method of obtaining the arsenic for examination, what are the most advisable properties to employ for testing it? What tests furnish in the circumstances the best evidence? For this is the point to which all chemical inquiries in medical jurisprudence ought to tend.

In my opinion no method of testing approaches the following in facility, delicacy or conclusiveness. Cut the copper, on which the arsenic is deposited, into small chips, so that they may be easily packed in the bottom of a small glass tube, and apply a low red heat. A white crystalline powder sublimes; and if this be examined in the sunshine, or with a candle near it, a magnifier of four or five powers will enable the observer to distinguish the equilateral triangles composing the facets of the octahedral crystals, which are formed by arsenious acid when it sublimes. Sometimes the three equal angles, composing a corner of the octahedre, may be seen by turning the glass in various directions. If triangular facets cannot be distinguished, owing to the minuteness of the crystals, then shake out the copper chips, close the open end of the tube with the finger, and heat the sublimed powder over a very minute spirit-lamp flame, chasing it up and down the tube till crystals of adequate size are formed. Next boil a little distilled water in the tube over the part where the crystalline powder is collected; and when the solution is cold, divide it into three parts, to be tested with ammoniacal nitrate of silver, ammoniacal sulphate of copper, and sulphuretted hydrogen, either in the state of gas or dissolved in water.



Here I cannot help expressing my surprise, that both in the inquiries carried on in various quarters respecting Reinsch's process, and in the multitudinous researches that have been made on the subject of Marsh's method, during the last four or five years, by Professor Orfila, M. Lassaigne, MM. Danger and Flandin, M. Malapert, M. Coulier, M. Dupasquier and M. Chevalier in France; by Professor Liebig, Mohr, Pfaff and Petenkofer in Germany; by Mr. L. Thomson, Mr. H. H. Watson and Mr. Marsh himself in Britain, and by other experimentalists who might also be mentioned, no one to my knowledge has thought of applying, as a test of the nature of an arsenical crust, the conclusive process described above, and first suggested to me in 1826 by the late Dr. Turner, which consists in converting the metal into the oxide, in such a way as to allow the form of its crystals to be determined. The method, I have reason to know, has been in constant use in medico-legal researches in Scotland; but I have not heard of its being currently employed elsewhere. Yet what other method is so satisfactory? What other metalliform substance but arsenic yields, by heat and oxidation, a white sublimate with triangular facets? Or suppose this single character be thought not enough to characterize the substance under examination, what other character of the arsenical crust leaves the substance in such a state as to be so easily subjected to so many excellent supplemental tests?

In employing Reinsch's process with the system of tests super-added, as now explained, the following particulars have incidentally occurred to me as worthy of notice:—

In boiling organic substances in the weak hydrochloric acid, care must be taken to ascertain that there is a decided excess of acid always present. 2 fluidrachms to every 8 oz. of liquid are in general sufficient; but if the organic matter be an animal texture in a state of decay, a much larger quantity of acid may be necessary, owing to the presence of ammonia, which tends gradually to neutralize the acid as the solution goes on. Reinsch does not advise filtration of the fluid after the acid has acted sufficiently on the subject of analysis. But notwithstanding the delay occasioned by filtration, this seems to me advisable in most instances, otherwise organic particles are apt to attach themselves to the copper, and thus give rise to empyreuma, when the metallic arsenic is driven off by heat. The most convenient form for using the copper is that of copper-leaf; but ordinary plates of copper may be easily made of any degree of fineness by immersing them for a time in diluted nitric acid. Where the quantity of arsenic in the fluid is supposed to be small, nearly half an hour should be allowed to elapse before the copper is removed. Before applying the sulphuretted hydrogen as a test to the solution of the sublimed oxide, the solution must be acidulated with hydrochloric or acetic acid. In every case the whole process should be applied in the first instance to distilled water, acidulated with the hydrochloric acid to be employed afterwards; and if the copper be tarnished, a purer acid must be obtained, or the copper must be subjected to the subsequent steps of



the process, in order to ascertain whether the tarnishing be occasioned by arsenic or not.

I have employed the preceding method in two medico-legal cases. In one,—where the body had been buried for four months, and where the arsenic had been detected in the contents of the stomach by Marsh's method, and in a portion of the liver in the same way, preceded by Orfila's process for the destruction of animal matter,—I succeeded very easily in obtaining from about a sixth part of the stomach, after it was thoroughly washed, repeated steel-coloured crusts upon copper, which, when heated in a tube, gave out white crystals with triangular facets; and the solution of these crystals gave characteristic indications with the three liquid reagents, ammoniacal nitrate of silver, ammoniacal sulphate of copper, and sulphuretted hydrogen water. In the other case, also four months after interment, the contents of the stomach, boiled with muriatic acid and filtered, were not visibly altered by a stream of sulphuretted hydrogen gas which was applied to a drachm of the fluid. Nevertheless Reinsch's method yielded precisely the same results as in the former instance. A portion of the liver, amounting to a sixth of the whole organ, which had been sent from the country along with other materials for analysis, was then subjected to the same process. Arsenic was also indicated, but in very minute quantity. I was satisfied with the application of one liquid reagent to the solution of the sublimate, namely, the ammoniacal nitrate of silver; but there was solution enough for all three. By the same method as that applied to the liver I obtained arsenic in larger quantity from one half of the stomach.

The experience I have had of this method of analysis in medico-legal researches, brief though it be, is yet sufficient to convince me that it must soon supersede the beautiful but much more elaborate method of Mr. Marsh. It may be applied even to the tissues of the stomach, and including the process of filtration, in the short space of two hours.—*Lond. and Edinb. Month. Journ. of Med. Science* for September 1843.

## PHARMACOLOGY.

### *Observations on Leeches.* By OTTO KÖHNKE.

IN consequence of the premium offered by the French Society for the Encouragement of Arts, in the year 1840, for the best observations on leeches, the most advantageous methods of rendering them fit for frequent use, and for multiplying them in artificial ponds, I was induced to make the following experiments:—

Every one who has had much to do with the treatment of leeches will be aware of the great trouble and care required to render them serviceable a second time. I have succeeded in making them fit for use three, four, and even five times, by a method which I am not



aware has hitherto been employed. The results of my experiments I will communicate in the present article.

In these experiments different species of leeches were employed, for instance—

*Sanguisuga interrupta*, M. T.

*Sanguisuga officinalis*, Savig.

*Sanguisuga medicinalis*, Savig.

which are described in every good work on zoology.

*S. medicinalis* was obtained from Jutland, where it still occurs in plenty.

The treatment was as follows:—Each kind was kept in an open wooden jar, containing a sufficient quantity of water and some fresh plants of *Calamus*. The border was rubbed in on the interior for two inches with dilute sulphuric acid. As soon as the leeches had been employed they were thrown into a vessel in which were placed some beech-wood ashes; in a very short time they had vomited all the blood, and were then removed as quickly as possible, in order not to weaken them too much, on to a sieve, and well washed; and after having undergone this treatment they were conveyed into a vessel containing water, and coarsely-pounded, well-washed charcoal, and here left for the space of twelve hours, upon which they were removed into the above-mentioned jars.

In this manner I obtained with 180 leeches (60 of each kind) the following results:—I may observe that they were employed at intervals of from three to four weeks, from July to October of the same year.

*S. interrupta.*

	Leeches employed.	Number which died in the interval.	Observations.
1st time	60	7	The first time 2 would not suck, the second time 5, and the fourth time 3, after which the remainder died within 8 days.
2nd ...	53	31	
3rd ...	22	14	
4th ...	8		

*S. officinalis.* Hungarian Leech.

1st time	60	9	The second time 3 would not suck, the third time 2, and the fourth time 1, the remainder died within 19 days.
2nd ...	51	37	
3rd ...	14	10	
4th ...	4		

*S. medicinalis.*

1st time	60	4	The first time 1 would not bite, the second time 6, and the fourth time 7, the remainder all died within 5 days.
2nd ...	56	18	
3rd ...	38	19	
4th ...	19	10	
5th ...	3		

From these results *Sanguisuga medicinalis* would seem to deserve



the preference, but the shortness of the transport may perhaps account for this considerable difference.

Other experiments have at the same time taught me that when the leeches are employed only at intervals of from eight to ten weeks they preserve far better.

The treatment of leeches in the manner above described would lead, especially in large hospitals, to a considerable saving of expense. It need scarcely be mentioned that this plan cannot be adopted with those which have been applied to individuals suffering from contagious diseases. For such cases I may however direct attention to the fact, that when a portion of the foot of the leech is cut off while it is sucking, the leech then, instead of removing as usual 1 or  $1\frac{1}{2}$  oz. of blood, will take 3, 4, and even 5 oz. Should this be confirmed, it will be possible to effect with one leech what otherwise would require two or three.

With the constantly-increasing rarity and expense of the officinal leech, it is certainly desirable to draw more attention to the horse-leech, *Hirudo vorax*, which is met with in many districts in considerable numbers.

I have also made some experiments with these leeches, and have generally obtained similar results. Thirty specimens of ordinary size were employed, and I never observed any serious inflammatory wounds, or other ill consequences, result from their use. Even were they not to be employed on the more tender parts of the body, they might still be made use of in very many cases.

I will now add some observations on the preservation and breeding of the leech, and also a word or two respecting the difficulty which sometimes occurs of bringing the leeches to bite.

With respect to the preservation of leeches, I have frequently had occasion to keep them, even in very considerable quantities, for half a year and more in pure water, in which were placed some plants of *Calamus*, renewing the water every eight days in summer, and every three or four weeks in winter. This plan I consider to be the best, especially with small quantities.

I cannot advise the use of loam, turf, or patches of grass intermingled with roots of *Calamus*, which are frequently had recourse to, as I have learned from experience that it is not only difficult to cleanse the vessel under such circumstances, but that in doing this and replacing these substances, which must be done at least every three weeks in summer, a number of leeches are wounded and crippled.

The vessel which I employ for preserving large quantities is constructed of *beech-wood*, and is about 4 feet high and as many in circumference. In it is placed grass turf, arranged on shelves one above the other for three quarters of its height, and in a funnel-shaped form, so that the water may easily run off. It contains a false bottom, below which is a cock, with an arrangement to prevent the leeches from escaping, through which the water may be drawn off. The lid consists of a wooden frame, with varnished iron-wire net-work with rather wide meshes. The inside of this frame is moistened from time to time with sulphuric acid, which prevents



the leeches from creeping on the sides of the vessel. The acid does them no harm, but appears on the contrary to prevent their dying so easily, and moreover to render them sooner fit for use. In a vessel or pail of this kind from 3000 to 5000 leeches may be kept.

With respect to the breeding of leeches, I obtained in autumn from 4000, kept during last summer in a vessel of the kind described above, about 700 young leeches.

One of the greatest inconveniences with leeches is when they refuse to bite, and although considerable attention has been paid to this subject, most of the means advised under such circumstances are attended with little success. Martius, in his 'Zoology,' mentions several, one of which I have found to do good service. As it is always to be had, it deserves to be better known. When weak beer is warmed to about 100° Fahr., and the leeches left for a few minutes in it, they suck with the greatest avidity. Those which will not suck after this treatment I have almost always found to be ill.—*Archiv der Pharm.* for July.

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The scarcity of these useful animals, and consequently their high price, is now becoming so much felt in several parts of Germany, that the Saxon government has recently issued an order requesting all physicians and practitioners to return the leeches after their use immediately to the chemists and druggists, who have to forward them, as soon as they have collected a certain number, by post (the expense of which is allowed by government) to one of the two institutions which exist in that country for the breeding of leeches, Moritzburg and Leipzig. In the same decree the government offers a premium of five hundred dollars to any person who will establish a proper nursery or breeding-place for these animals. This order, which is published in several of the Pharmaceutical journals and papers of Germany, is dated "Dresden, June 3, 1843."—*Ed. Chem. Gaz.*

*On a sure Method of distinguishing Aqua Amygdalar. amar. from Aq. Lauro-Cerasi. By F. W. WEBER.*

As is generally known, these waters are usually distinguished by the smell. As this may easily lead to mistake, the following extremely simple and certain test appears to me worthy of notice. Two test-glasses are taken, into each of which a couple of drachms of the above waters are conveyed, and to each of which is then added about a scruple of solution of caustic ammonia. After being allowed to stand for a time, the cherry-laurel water will be found to have assumed a milky-white colour, while the bitter-almond water remains wholly unchanged.—*Archiv der Pharm.* for July.



## CHEMICAL PREPARATIONS.

*On some Preparations of Ergotine.*

IN a late Number of this Journal, p. 550, we drew attention to the interesting observations of M. Bonjean on the preparation and properties of ergotine; since the publication of that paper he has communicated in the 'Journ. de Pharm.' the following formulæ for the employment of the ergotine so prepared:—

*Mixture of Ergotine.*

R <sub>x</sub> Ergotine .....	24 grs.
Ordinary water.....	3 oz.
Syrup of orange flowers .....	1 oz.

This mixture to be taken in spoonfuls in the course of a day for an hæmorrhage, and every ten minutes in a case of inertness of the matrix, until the expulsive pains have brought about the accouchement. This dose of ergotine is sufficient to stop immediately, or almost immediately, an ordinary hæmorrhage; but in a serious case it may be raised to one or two scruples, and more.

*Syrup of Ergotine.*

R <sub>x</sub> Ergotine .....	160 grs.
Dissolved in orange-flower water .....	1 oz.
Simple syrup .....	1 lb.

Boil the syrup and add it to the solution. A pound of syrup is thus obtained, each ounce of which contains 10 grs. of ergotine.

*Pills of Ergotine.*

R <sub>x</sub> Ergotine .....	24 grs.
Liquorice powder.....	2 scr.

Six pills to be taken in a day. These pills may be silvered if requisite.

Of all the preparations the mixture is that which appears to act most promptly. In all cases this remedy should be continued until every morbid symptom has disappeared; it is even prudent, in order to avoid relapse, to continue its employment for some time after the cessation of the disease.

*Preparation of Iodide of Potassium, according to M. BARBET LARTIGUE.*

Of the various methods of preparing iodide of potassium the author prefers that of saturating carbonate of potash with hydriodic acid; but in order to meet the objection made to the separate preparation of the hydriodic acid, he has altered the method as follows:—

Carbonate of potash, prepared by igniting 2 parts of *Cremor tartari* with 1 part of nitre, is dissolved in water until the solution indicates from 20° to 25° Beaumé. The solution is conveyed into a



glass with a wide mouth, and is mixed up with a quantity of iodine amounting to nearly twice the weight of the dried carbonate of potash. The vessel is warmed over a charcoal fire, and a current of sulphuretted hydrogen passed through it so as to come in contact with the iodine. Reaction immediately ensues, carbonic acid is given off, the iodine gradually disappears, and the liquid becomes colourless. When the process has once commenced there is no need of further heating, but frequent stirring with a glass rod is sufficient. Test paper will readily indicate whether more iodine or carbonate of potash should be added. When the reaction is terminated and the liquid is neutral, the solution is boiled for a few minutes in a porcelain dish, filtered boiling hot, and then evaporated until it forms a pellicle on the surface; it is then placed on the sand-bath; on the following day the crystals of iodide of potassium are put on a filter to drain, and are then dried without previous ignition. The mother-ley affords, on further evaporation, another beautiful crop of crystals. The second ley, which is coloured somewhat yellow, must be evaporated to dryness, the residue submitted to a red heat for a quarter of an hour in a small retort, then again dissolved in water, the separated carbon removed by filtration, and the solution evaporated to crystallization.

The author does not state the amount of produce, but he observes that the chemist should always himself prepare the iodide of potassium, as that which is met with in commerce is most frequently adulterated with chloride of sodium.—*Journ. de Méd. de Bordeaux*, 1843, p. 26.

#### *Adulteration of the Bi-antimoniate of Potash.*

M. Mialhe states in the 'Bulletin de Thérapeutique,' that he has found some bi-antimoniate of potash of commerce to contain 50 per cent. of carbonate of lime.

#### *Preparation and Composition of the Hydrate of the Oxide of Uranium. By M. MALAGUTI.*

Pure nitrate of the oxide of uranium is dissolved in absolute alcohol and evaporated at a gentle heat, so that the liquid does not come to a boil. As soon as the mass has attained a certain degree of concentration a violent motion occurs, and evolution of nitric æther, nitrous acid vapours, accompanied with an odour of aldehyde and formic acid. The residue of this violent action is a yellowish orange-coloured porous mass, which may be separated by water into two substances, one of which is soluble (undecomposed nitrate of uranium), the other is insoluble, and of a beautiful canary-yellow colour; the latter substance is well washed with boiling water until it no longer possesses any acid action, and now constitutes the combination of oxide of uranium with 1 atom of water.

The specific weight of the hydrate of the oxide of uranium at 59° Fahr. is 5.926; heated in a glass tube it gives off neutral water



and becomes brown; it dissolves very readily in cold nitric acid. As on heating it exposed to the air variable quantities of black and olive-coloured peroxide of the protoxide are formed, the amount of water cannot be determined in this manner; but the hydrate must be heated in a current of dry air in a glass tube, and the water given off collected over chloride of calcium. Three experiments gave 6.36, 6.07, 6.00 per cent. water; the formula  $U^2O^3 + HO$  requires 5.88; it is not even possible in a well-regulated metallic bath to remove the whole of the water from the hydrate without a loss of oxygen.

*Pills of the Acid Sulphate of Quinine.*

The use of sulphate of quinine in the form of pills, in order to cover the bitter taste of this valuable agent, has the inconvenience of leaving some doubt as to its action. The pills, when they have reached the stomach, have to soften and dissolve; but while this is being effected, it is possible that they may pass through the pylorus, and their medicinal action be thus lost, as the alkaline juices of the intestines are not favourable to its absorption. To remedy this serious inconvenience, M. Mialhe recommends a very simple means, which consists in adding to the sulphate of quinine the small quantity of sulphuric acid requisite to render it soluble in water:—

R <sub>x</sub> Sulphate of quinine .....	1 grm.
Sulphuric acid .....	3 drops.
White honey .....	2 scr.

Form into a pill-mass, to be divided *ad libitum*. M. Soubeiran questions whether it would not be preferable to take the crystallized sulphate of quinine.—*Journ. de Pharm.* for August.

*Treatment of Croup with the Sulphate of Copper.* By Dr. SCHWABE.

This invaluable medicine in croup, first recommended by Serlo, has been used in more than fifty cases by the writer. He generally begins the treatment by applying from four to twelve leeches to the larynx, and then orders  $1\frac{1}{2}$ , 2, 3, and occasionally even 4 grs. of sulphate of copper, mixed with a few grains of sugar, to be taken every half-hour or every hour, according to the urgency of the symptoms. Each dose is followed by vomiting, which, slight after the first dose, is always copious after the second, and is continued so long as thick mucous or membranous concretions are apparent in the matters ejected. The patient then takes half a grain of the sulphate every hour, until several dark green motions have been discharged, to effect which from eight to twelve doses suffice.—Casper's *Wochenschrift*, No. 9, 1843, as inserted in the *L. and E. Medical Journal* for September.

*Preparation of the Mercurial Ointment.* By M. DAVID.

M. David is of opinion that the mercury in this ointment is not oxidated, but merely divided. This, he says, is easily demonstrated.



If 90 parts of fresh lard be triturated briskly for an hour with 190 of mercury, in a mortar kept steadily at the temperature of  $20^{\circ}$  cent., the mercury will be found to have disappeared entirely. But let the mass cool, and globules of mercury immediately begin to appear, and this they do, even for several days, in spite of all the rubbing that can be resorted to. But if so much oil of almonds be added as will keep the mixture of the consistence of honey (equal parts of lard and of oil of almonds), the globules of mercury will not reappear after they have once been subdued; and this may be done in a very short space of time.—*Journ. de Pharm.* for April 1843, as inserted in the *L. and E. Medical Journal*.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*On the Manufacture of Verdigris, especially of the Neutral Acetate of Copper.* By L. JONAS.

THREE kinds of verdigris are distinguished in commerce according to their colour, which depends on the basic constitution or amount of acid in the salt, viz.—

1. Common blue verdigris, subacetate of copper;
2. Common green verdigris, a mixture of the sesqui- and tri-basic acetate of copper; and
3. Crystallized, distilled verdigris, neutral acetate of copper (Berzelius).

All these salts of copper are mostly derived from France, and the mode of their preparation is described in every good work on chemistry.

The following new method of preparing them may perhaps be found worthy the attention of manufacturers and chemists.

Tribasic protochloride of copper (Brunswick green in the freshly precipitated state) is treated with solution of caustic ammonia until wholly dissolved, and then crude vinegar or concentrated vinegar added in excess. When the former is employed the liquid should be evaporated to half its volume; but with the latter the formation of verdigris results immediately on the temperature being raised to its boiling point. It is then separated by means of a strainer or filter.

To prepare the second kind in a similar manner the neutral salt is required.

A very interesting phænomenon occurs when a certain quantity of pulverized sulphate, nitrate or muriate of copper is dissolved in strong ammonia with the assistance of heat until perfectly neutralized, and to this liquid double the weight of the salt of concentrated vinegar (therefore in excess) is added, and the liquid made to boil; during the heating, and with a *peculiar elevation of heat*, minute green bright crystals of neutral acetate of copper form in groups on



the surface, which are precipitated on stirring, and so make room for the formation of more. The formation of this salt takes place with such rapidity that in a very short time the entire solution is separated into two portions, of which the upper one is a transparent clear liquid of greenish colour, while the inferior stratum consists entirely of crystals of a beautiful silky lustre.

2 lbs. of sulphate of copper furnish in this way exactly  $1\frac{1}{2}$  lb. of crystals of verdigris, which may be employed in the arts as a perfect substitute for the French sort in crystals.

From the residue, which is allowed to stand, some crystals separate, which are perfectly identical with the French.

The residue which remains in the preparation of verdigris by means of the Brunswick green, may be employed in the manufacture of this latter colour in the usual way (by means of chloride of ammonium), while that resulting from the above salt after evaporation or distillation, in order to obtain the excess of acetic acid, affords a double salt of sulphate of copper and sulphate of ammonia. These crystals resemble in their external appearance very much those of the sulphate of copper, and may either be employed in the arts or be used in the preparation of ammonia; or they may be worked again with solution of ammonia and strong vinegar for verdigris. There is therefore no loss of material in this manufacture.

This rapid formation of the neutral acetate of copper may easily be accounted for in the formation of the tersulphate of copper and ammonia, which is decomposed by the excess of acetic acid.

There is every reason to suppose that in the usual mode of preparing verdigris in the manufactories in which the refuse of grapes and tartar are employed, the acid nitrogenous liquids which originate by the fermentation afford ammonia, which acts a considerable part in the formation of this substance, judging from the ease with which the salt may be prepared from ammonia and oxide of copper.

The neutral acetate of copper, prepared according to the above method, may be used with advantage for pharmaceutical purposes, for instance in the preparation of *Oxymel æruginis*, verdigris ink, &c., and may be obtained in any quantity in a very short time.—*Archiv der Pharm.* for August.

*On a new Colouring and Astringent Substance from Buenos Ayres.*  
By M. VIREY.

Recently a substance of this kind has found its way into commerce, which has a black, vitreous appearance, is dry and brittle, and possesses an astringent, bitter, subsequently sweetish taste, and an odour resembling that of liquorice. This extract is already extensively used in several houses for the production of brown and other dark colours. The plant from which it is obtained is a tree belonging to the Leguminous family, and known in the Rio de la Plata under the name of Algaroba. The beans and pods are collected and macerated exposed to the sun with water, which is frequently renewed, and which on evaporation affords the extract in question.



The Algaroba and Algarovilla (the smaller kind) are not identical with the Caruba, Garoba of the Spaniards and Portuguese, but are species of the genus *Prosopis* or *Inga*, belonging to the great division of the *Acaciæ* and *Mimosæ* among the *Leguminosæ*. Their pod contains in the fresh state a sweet astringent medulla, which in times of scarcity is used as food, resembling in this respect the Caruba tree, the *Siliqua dulcis* of the ancients. It is therefore probable that the *Inga cochliocarpos* with curved pods, which are astringent like the bark of the tree, the *Acacia coriacea*, DeCand., and various other species of *Acacia* and *Inga*, may afford extracts which might be employed for dyeing brown, and would give black colours with salts of iron. They have also a saponaceous character, and foam strongly with water. There exist, in fact, *Acaciæ*, the bark of which contains a saponaceous substance, for instance the *Cortex saponarius*, Rumpf., from Amboina, which is probably derived from *Mimosa saponaria*.

The *Succus Acaciæ verus*, known to the ancients under the name of Lycion, is obtained at the present day in Egypt and Arabia from the *Acacia vera* of Willdenow.—*Archiv der Pharm.* for June.

## PATENTS.

*Patent granted to William Hunt, Portugal Hotel, Fleet Street, London, for Improvements in the Manufacture of Potash and Soda, and their Carbonates.*

IN manufacturing carbonate of soda, it is the usual practice to decompose common salt by means of sulphuric acid (which has hitherto been obtained for such purpose at great expense), and then to convert the sulphate of soda, produced by such decomposition, into carbonates of soda.

By this improved process common salt is decomposed, either by means of the metallic sulphates hereinafter mentioned, or by means of sulphuric acid, obtained by the use of these sulphates and the metallic sulphurets hereinafter mentioned, or some of them. The sulphate of soda thus produced is decomposed with coke or other carbonaceous matter; and by dissolving the product of this decomposition, a solution containing hydrosulphuret of soda is obtained. This hydrosulphuret is decomposed by means of one of the metallic oxides, and sulphur is thus transferred from the solution of hydrosulphuret to the metal of the oxide employed. A mixture of caustic soda in solution is thus obtained, and also insoluble metallic sulphuret. These are separated, and the sulphuret is either subjected to the processes by which sulphuric acid and metallic oxide are obtained, or it may be converted into sulphate, and used to decompose common salt, and produce sulphate of soda and muriate of the metallic oxide employed, and afterwards obtain from this muriate metallic oxide.



The oxide produced by either of the above means is suitable to be used for decomposing hydrosulphuret of soda, and thereby producing a further quantity of caustic soda in solution; and by using it for this purpose a metallic sulphuret is reproduced, suitable to be employed for producing a further quantity of sulphuric acid, metallic sulphate and metallic oxide.

The caustic soda obtained, in solution, is either used in this state, or the solution is evaporated to obtain solid caustic soda; or the caustic soda may be converted into carbonate of soda by causing it to absorb carbonic acid; and the solution may then be evaporated to obtain dry carbonate of soda or crystals of soda.

The metallic sulphates employed by the patentee for decomposing common salt, or for producing sulphuric acid and metallic oxide, are the sulphates of copper and of zinc; and the metallic sulphurets used for producing sulphuric acid and metallic oxide are the sulphurets of copper and of zinc; and the metallic oxides used for decomposing hydrosulphuret of soda are the deutoxide of copper and the oxide of zinc.

When sulphuric acid is used to decompose common salt and produce sulphate of soda, this decomposition is effected by some of the means in ordinary use for that purpose.

When sulphate of copper is used to decompose common salt, a solution containing this sulphate is obtained, and common salt added until the solution contains 5 per cent. more salt than is equivalent to the sulphuric acid, and these are digested together; a solution is thus obtained containing sulphate of soda and muriate of copper. The solution is then evaporated, and a great part of the sulphate of soda separated in small crystals, which are then washed with water to separate the muriate of copper therefrom. The crystals are then dissolved, and any copper contained in the solution precipitated by means of metallic iron or of a solution of hydrosulphuret of soda; the solution being then evaporated, sulphate of soda is obtained, fit for the manufacture of soda.

After the sulphate of soda is thus separated from the muriate of copper, the muriate is decomposed by means of metallic iron or of lime. If iron be used for this purpose, it is introduced into the solution, and copper obtained, as a precipitate, and muriate of iron in solution. If lime be used, a fine milk thereof is prepared, and added gradually to the solution of muriate of copper, until the copper is thrown down as a hydrated deutoxide of copper; the mixture is then placed in a reverberatory furnace, and the water driven off by heat; a dry deutoxide of copper, mixed with chloride of calcium, being thus obtained, which products are separated by washing the remaining deutoxide of copper.

When sulphate of zinc is used to decompose common salt, a solution containing this sulphate is obtained, and common salt added until the solution contains 5 per cent. more salt than is equivalent to the sulphuric acid; these are then digested together, and a solution obtained containing sulphate of soda and muriate of zinc; the sulphate of soda is then separated by the means above described for



separating sulphate of soda from muriate of copper; and any zinc contained in the solution of sulphate of soda is precipitated by means of hydrosulphuret of soda; the solution is then evaporated, and sulphate of soda obtained, suitable to be used for the manufacture of soda. After the sulphate of soda is separated from the muriate of zinc, the muriate is decomposed by means of lime or steam and heat. If lime be used, the same mode of proceeding is adopted as described with reference to the decomposition of muriate of copper; and an oxide of zinc is produced, fit for decomposing hydrosulphuret of soda and producing soda. If steam and heat be used, the solution of the muriate is introduced into a furnace and evaporated to dryness, thus producing a chloride of zinc: the heat is then increased, and a current of steam passed over the chloride; muriatic acid is thus driven off, and an oxide of zinc obtained, any remaining chloride being separated by washing; after which the oxide of zinc will be suitable for decomposing hydrosulphuret of soda and producing soda. When the solution is obtained, containing sulphate of soda and muriate of zinc, by the means above mentioned, the patentee sometimes introduces it into a furnace, called a "distilling furnace," and the water is driven off, thus converting the muriate of zinc into chloride; the heat of the furnace is then increased to a degree sufficient to cause the chloride to volatilize, and the vapour conducted into a receiver, and there condensed. The residuum in the furnace contains sulphate of soda, oxide of zinc, and muriate or sulphate of zinc, which residuum is digested with water, and the sulphate of soda and sulphate or muriate of zinc is thus dissolved. The oxide will remain undissolved; any zinc contained in the solution is then precipitated by means of hydrosulphuret of soda, and the solution afterwards evaporated, thus obtaining sulphate of soda, suitable for manufacturing soda. The condensed chloride of zinc collected in the receiver is dissolved, and a solution of muriate of zinc obtained; the muriate is then decomposed by means of lime, in the same manner as before described for decomposing muriate of copper, and an oxide of zinc obtained, fit for decomposing hydrosulphuret of soda, and producing soda. The dry sulphate of soda, for that purpose, may be decomposed by mixing it with powdered coke or coal in the proportion (by weight) of about 3 parts of sulphate to 1 part of coke or coal, and fluxing this mixntre in a reverberatory furnace, which is termed the "decomposing furnace."

By decomposing sulphate of soda, a sulphuret of sodium is obtained, mixed with caustic soda, carbonate of soda, and other matters; this product is dissolved by lixiviating it with water, and a solution obtained, containing hydrosulphuret of soda and some sulphuret of soda; this solution is to be boiled in suitable vessels, and a mixture then added of deutoxide of copper and metallic copper, or of oxide of zinc and metallic zinc, in the proportion of 20 parts (by weight) of deutoxide of copper or oxide of zinc to 1 part (by weight) of metallic copper or metallic zinc; the boiling is continued, and the mixture of oxide and metal gradually added, until



the hydrosulphuret of soda and the sulphuret of soda are completely decomposed. The products of this decomposition are caustic soda, in solution, and an insoluble metallic sulphuret; and, in order to separate these, the sulphuret is allowed to subside, the solution drawn off, and the sulphuret washed with water, to extract a further quantity of soda; caustic soda is thus obtained, and the solution may be evaporated until it becomes sufficiently strong to yield solid caustic soda.

The patentee next describes the process by which he obtains metallic sulphates, sulphuric acid and metallic oxides (suitable to be used in the operations above described) from the sulphurets of copper and zinc, obtained by the processes before mentioned. When it is desired to produce metallic sulphate, a furnace, termed the "sulphating furnace," is used. This furnace having been heated until it has attained a temperature of about  $400^{\circ}$  Fahr., sulphuret of copper or of zinc is placed therein, and a current of atmospheric air caused to pass through it. The heat is kept up, and the sulphuret raked occasionally, and at the end of about twelve hours the greater part of the sulphuret will be converted into sulphate. The product of this sulphating operation is to be lixiviated with water, and a solution will thus be obtained of sulphate of copper or of zinc (as the case may be), suitable for decomposing common salt. The residuum of this lixiviation will contain oxide and sulphuret. If the oxide predominate, it is used to decompose the hydrosulphuret of soda; but if the sulphuret predominate, the residuum is returned into the sulphating furnace, for the purpose of converting the sulphuret into sulphate. When the sulphate obtained by the sulphating operation is to be used for making sulphuric acid, the product of such operation is placed in the distilling furnace; and such product is heated to a bright red heat, by which means sulphuric acid is driven off. During this operation a small current of atmospheric air passes through the distilling furnace, and the gases produced pass through a pipe, provided for that purpose, into a condensing apparatus, similar to the leaden chambers now in general use in the manufacture of sulphuric acid.

In the process described for obtaining sulphuric acid from sulphuret of copper or sulphuret of zinc, the sulphuret employed is converted into sulphate in the first instance; but the patentee also obtains sulphuric acid by the use of either of these sulphurets, without previously converting it into sulphate. For this purpose the sulphuret is dried by any convenient means, and then put into a "furnace of combustion," and there heated to redness; during which operation a current of atmospheric air passes through the furnace, and sulphurous acid gas is produced by the action of the atmospheric air on the sulphuret. The gas passes off through a pipe, provided for that purpose, into a leaden chamber, similar to those generally used in the manufacture of sulphuric acid; and the sulphurous acid thus obtained is converted into sulphuric acid by means of nitrous acid vapour and the atmospheric air which has passed through the furnace of combustion. The residuum which



remains in the distilling furnace and the furnace of combustion (after the distilling operation and the operation of combustion have been completed), contains oxide of copper or oxide of zinc (as the case may be), sulphate and subsulphate; and may be rendered suitable for decomposing hydrosulphuret of soda and producing soda.

The patentee here describes a mode by which sulphuric acid may be obtained from a mixture of sulphate and sulphuret of copper or of zinc.

The following is a description of the invention as applied to the manufacture of potash and its carbonate. The salts of potash to be used are the muriate, the nitrate, and the sulphate of potash. When the muriate is employed, the invention is applied in the same manner, in every respect, for producing potash and its carbonate by the use of this salt, as before described for producing soda and its carbonate by the use of common salt, which is known to be muriate of soda. Nitrate of potash, when used, is decomposed by sulphuric acid, and thus sulphate of potash and nitric acid are obtained; and this, or any other sulphate of potash, is used for producing potash and its carbonate, in every respect, in the same manner as that described for producing soda and its carbonate by the use of sulphate of soda.

The patentee's claims are as follow:—He claims, as his invention, a combination of processes by which potash or soda may be produced by the action of deutoxide of copper or oxide of zinc obtained from the sulphuret of copper, or the sulphuret of zinc produced by the use of his invention on hydrosulphuret of potash or hydrosulphuret of soda; and the metallic sulphuret produced by this action is either converted into deutoxide of copper or oxide of zinc, suitable to be applied to act on hydrosulphuret of potash or hydrosulphuret of soda; and the sulphur contained in the sulphuret is converted into sulphuric acid, fit for decomposing muriate or nitrate of potash or common salt, for the purpose of manufacturing potash or soda; or otherwise the metallic sulphuret produced is converted into sulphate of copper or sulphate of zinc, and this sulphate is used to decompose muriate of potash or common salt, and produce sulphate of potash or sulphate of soda, and also deutoxide of copper or oxide of zinc, suitable for decomposing hydrosulphuret of potash or hydrosulphuret of soda to produce potash or soda. He also claims the manufacture of carbonate of potash and carbonate of soda by means of the potash and soda obtained by such combination of processes as hereinbefore mentioned. He also claims the application in the manufacture of potash or soda, or their carbonates of sulphate of potash or sulphate of soda, obtained by decomposing muriate of potash or common salt, by means of sulphate of copper or sulphate of zinc obtained from the sulphurets of these metals. And he also claims the improved mode of decomposing sulphate of potash and sulphate of soda, for obtaining hydrosulphuret of potash or hydrosulphuret of soda, to be used in the manufacture of potash or soda, or their carbonates; which improved mode consists in decomposing sulphate



of potash or sulphate of soda, and thus producing sulphuret of potassium or sulphuret of sodium, by causing such sulphate, in a state of fusion, to flow gradually through a bed of coke or coal.—Sealed January 21, 1840.

*Patent granted to William Godfrey Kneller, Wimbledon, for Improvements in the Manufacture of Soda, in the Evaporation of Brine, and in the Concentration and Manufacture of Sulphuric Acid.*

This invention relates to the manufacture of soda, the evaporation of brine, and the manufacture and concentration of sulphuric acid; and in carrying out the first and second improvements, the apparatus consists of a metal evaporating pan containing a case, into which high pressure steam is admitted, for the purpose of heating the liquid to be evaporated, instead of applying heat to the under surface of the evaporating pan. The case contains a number of short vertical tubes, through which pipes pass; these pipes branch from a large pipe, and descending below the steam-case introduce streams of compressed air into the liquid. The effect of this contrivance is, that the rapid escape of the compressed air through the pipes causes a proportionably quick evaporation of the liquid exposed to its action.

In evaporating a solution of caustic soda by this apparatus, the carbonic acid contained in the compressed air, although small in proportion, becomes great in the large volumes of air continually passed through the liquid; and thus the sulphur, lime and other impurities, which were held in solution during the caustic state of the soda, become insoluble, and precipitate on its change to the milder state, and are readily separated by means of filtration.

When evaporating brine, the salt in crystallizing falls to the bottom of the evaporating pan, and is raked out as usual.

In the manufacture of sulphuric acid streams of compressed air are made to act upon the mixture of sulphur and nitre whilst it is burning in the furnaces connected with the leaden chambers used in this manufacture, and thereby a more perfect combustion of the same is effected.

When concentrating sulphuric acid in leaden or earthen vessels, compressed air is introduced into the acid mixture through numerous descending leaden pipes, and by means of this improvement the concentration is effected at such a low temperature that no injurious action can take place upon the containing vessel.

It is preferred that the air should pass through wire gauze, or other suitable material, to prevent any dust, or other superfluous matter, from becoming mixed with the sulphuric acid.—Sealed Dec. 22, 1842.



# THE CHEMICAL GAZETTE.

No. XXIII.—October 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Gall.* By Professor LIEBIG.

THE liquid which is secreted in the gall-bladder of animals, and which is generally known by the name of gall, has a faintly alkaline reaction and a thickish oily appearance; it is of a pure gold-yellow or greenish-yellow colour, which becomes darker by exposure to the air; it mixes with water in every proportion, forming a solution which froths like soap-water, and possesses a very bitter, subsequently sweetish taste, which continues for a long time. Gall dried in the water-bath dissolves readily in alcohol, forming a dirty dark green solution, which by transmitted light appears of a red colour, and leaving behind a substance containing much nitrogen, which swells in water like gelatine (mucus of the gall-bladder). The gall may be obtained perfectly colourless by digesting its alcoholic solution with bone black; it may further be separated by careful addition of barytic water, from the colouring substance which forms with barytes an insoluble combination (Berzelius). It contains cholesterine, which may easily be removed by mixing a concentrated solution of the gall in alcohol, after decoloration with animal charcoal, with double its volume of æther, on which the gall, which is not soluble in æther, separates in the form of a thick syrup; the cholesterine remains dissolved in the æther, and is obtained on evaporation in snow-white laminated crystals.

The gall, freed from the colouring substance, and by repeated treatment with æther from fat, affords when dried a solid mass resembling gum-arabic, which may be reduced to a powder, and dissolves without any opacity and without any residue in water and anhydrous alcohol; it is separated from its aqueous solution by saturation with hydrate of potash in the form of a thick syrup of the consistence of turpentine. Acetic and oxalic acids cause no change in the aqueous solution, but the addition of a mineral acid produces immediately, or after some time, a milkiness, and a syrupy liquid separates; a portion of the mineral acid is found combined with soda. Acetate of lead and nitrate of silver precipitate the solution of gall purified by the above process. A solution of purified gall is thrown down *entirely* by the addition of tribasic acetate of lead, so that only



a quantity of organic substance, corresponding to the somewhat soluble lead compound, remains in solution; an excess of the acetate of lead salt redissolves a portion of the precipitate (Enderlin, J. Liebig). Neutral acetate of lead forms no precipitate in an alcoholic solution of pure gall; basic acetate of lead, on the contrary, produces a plaster-like precipitate, which dissolves on the addition of neutral acetate of lead.

An aqueous solution of gall is precipitated immediately by neutral acetate of lead, the liquid at the same time acquiring an acid reaction; a solution of gall, to which acetic acid has been added, is not precipitated by acetate of lead; the acid therefore which is set free on precipitating the gall with the neutral salt of lead prevents further precipitation by the same salt. If the acid be accurately neutralized by an alkali the neutral salt produces a fresh precipitate, and the liquid again becomes acid; for the same reason basic acetate of lead causes a fresh precipitate in the solution of gall, which had been previously treated with the neutral salt. When an aqueous solution of gall has been thrown down by neutral acetate of lead, a considerable portion of the gall remains on the further addition of subacetate dissolved in the excess of the neutral salt, and cannot be precipitated by salts of lead. That which remains in the solution after employing the neutral acetate and subacetate of lead, was considered by M. Gmelin and Berzelius as a distinct substance, and described as gall-sugar or biline, but it is nothing else than pure gall.

On solution in alcohol crude gall leaves no residue of carbonate of soda (to which therefore the alkaline reaction cannot be ascribed). Dissolved in alcohol, and dried over sulphuric acid in vacuum, it leaves behind a white or faintly-yellowish residue, which effervesces strongly with acids, and which consists for the greater part of carbonate of soda; it also contains traces of iron (Enderlin), phosphate of soda (Thénard and Enderlin) and common salt. Moistened with sulphuric acid and ignited, this residue amounts to 16·5 per cent. of the weight of the gall (Demarçay). The gall which has been freed from fat and colouring substance (by barytes), affords on calcination 11·7 ash, which consists of 11·16 carbonate of soda (and also traces of potash, Enderlin) and of 0·54 common salt (Kemp). The composition of gall freed from colouring substance and the fat acids is—

	Kemp.			Enderlin.	Theyer and Schlosser.		
Carbon . . . . .	58·46	58·46	59·9	58·28	58·00	58·49	59·48
Hydrogen . . . .	8·30	8·81	8·9	9·20	8·09	8·48	8·47
Nitrogen . . . . .	3·70	4·21					
Oxygen . . . . .	22·64	25·76					
Soda . . . . .	6·53	6·53					
Common salt . .	0·37	0·54					

After subtracting the fixed constituents, we obtain for the body combined with the soda,—

Carbon . . . . .	63·7
Hydrogen . . . . .	8·9
Nitrogen . . . . .	3·9
Oxygen . . . . .	23·5



If we admit that the soda is left after combustion in the state of neutral carbonate, 100 parts of pure gall will contain 64.9 carbon.

From the above composition of gall it is evident that it is a soda compound of a nitrogenous body, which we have every reason to class among the acids, since it possesses the property of neutralizing the soda. The smallest quantity of acetic acid suffices to remove the slightly alkaline reaction which the gall usually possesses, and in many cases it has no alkaline reaction. The best mode of preparing the acid contained in the gall, and which we propose to call choleic acid (*Gallensäure*), is as follows:—

*Gall acid. Choleic acid*, Demarçay; *Bilifellinic acid* of Berzelius.

*Preparation*:—1 part of effloresced oxalic acid is dissolved with the assistance of heat in a solution of 8 parts of dry (purified) gall in alcohol, the mixture boiled, and then placed aside for ten or twelve hours. Immediately on the dissolution of the oxalic acid a white paste of oxalate of soda in minute crystals separates, the quantity of which increases on cooling. As soon as it ceases to deposit crystals the liquid is filtered, diluted with water, and digested with carbonate of lead, until there is no longer any reaction of oxalic acid. The lead is removed by means of sulphuretted hydrogen, and the filtered solution is evaporated in the water-bath. The same body is obtained when gall dissolved in cold absolute alcohol is saturated with hydrochloric acid gas. The whole of the soda of the gall may be considered as separated when no further crystalline precipitate results on mixing with æther. After separating the salt the greater portion of the hydrochloric acid is removed by evaporation in the water-bath, some water added, when two strata are formed, one aqueous and very acid from the hydrochloric acid, the other a soft resinous deposit of choleic acid which is not soluble in the dilute mineral acid. This deposit is dissolved in alcohol, and finely-pulverized oxide of lead added gradually to the solution until the liquid indicates a faint excess of lead, which is removed with sulphuretted hydrogen.

Or, according to Demarçay, the alcoholic extract of the gall may be dissolved in 100 parts water, and with the addition of 2 parts of sulphuric acid diluted with 10 parts of water, evaporated in the water-bath, until after a few hours drops of oil become apparent on the surface, when it is allowed to cool. The choleic acid separates in the form of a thick liquid, which has the consistence of turpentine. The solidified mass which floats on the surface, and which is a mixture of cholesterine, margaric acid and oleic acid, is removed, and the evaporation of the acid liquid continued, allowing it to cool now and then, when fresh quantities of choleic acid separate. This is continued until the solution is reduced to a quarter of its original volume, the separated acid is then collected, washed with a little dilute sulphuric acid, and purified as above from any adherent sulphuric acid.

According to Theyer and Schlosser the pure gall is thrown down with basic acetate of lead, the precipitate heated with water to boiling, and dilute sulphuric acid gradually added until the precipi-



tate has lost its plaster-like consistence. The liquid is then filtered, and the oxide of lead remaining in the solution removed by sulphuretted hydrogen.

Choleic acid prepared according to these different methods must be dissolved in a very little alcohol, in order to remove the fat acids, and then precipitated by æther, which retains the fat acids in solution. Dried in the water-bath, or in vacuum over sulphuric acid, the choleic acid prepared from gall from which the colouring substance has been removed, is colourless or very slightly yellowish, has the appearance of gum, and is easily reduced to a powder of a resinous nature. The powder attracts moisture readily from the atmosphere, and cakes together; it is very bitter, is insoluble in æther, dissolves easily in alcohol, and in every proportion in water. The solutions possess a strong acid reaction; the dilute aqueous solution remains, after several days' standing, clear and colourless; it is not precipitated by acetic acid; the addition of dilute hydrochloric acid or sulphuric acid produces a milkiness, and the dissolved acid is deposited on the sides of the vessel in flocculent masses or in transparent oily drops. An excess of hydrochloric or sulphuric acid causes the turbidness to disappear immediately. The precipitate produced by mineral acids in an aqueous solution of choleic acid dissolves readily and entirely in pure water.

Choleic acid is not volatile; heated on platinum foil it melts, puffs up, burns with a strong smoky flame, leaving behind a voluminous coal, which when free from alkaline bases is entirely consumed. The acid prepared according to Demarçay's method always leaves a considerable alkaline residue, showing that it contained undecomposed gall, which remains in solution when the free acid has been removed by digestion with oxide of lead. The more incomplete the separation of the soda the more gall remains in the liquid. That this really is gall is very easily ascertained from its affording with dilute sulphuric acid exactly the same products as the gall itself, from its being precipitated by basic acetate of lead, and leaving behind carbonate of soda on calcination.

Demarçay and Dumas have obtained the following results by the analysis of choleic acid which had not been entirely freed from alkaline bases (the nitrogen was determined as gas):—

	I.	II.	III.	Dumas.
Carbon . . . . .	63·818	63·707	63·568	63·5
Hydrogen . . . . .	9·054	8·821	8·854	9·3
Nitrogen . . . . .	3·345	3·255		3·3
Oxygen . . . . .	23·779	24·217		23·9

On comparing these numbers with those obtained by Kemp, Theyer, Schlosser and Enderlin, in their analyses of pure gall, the nitrogen of which was determined in the form of ammonia, there cannot remain the least doubt that the choleic acid (bilifellinic acid) of the ox-gall is a substance of decidedly constant composition, for the analyses were made with gall and choleic acid at various times and in different countries; that, further, the choleic acid contains the same elements in the same proportion (with the exception of the nitrogen,



determined according to a more imperfect method, and a quantity of water, which has taken the place of the soda) as they are found in the organic compound of the gall itself.

If an alcoholic solution of pure gall be treated with effloresced oxalic acid, as described in the first method, the deposited oxalate of soda removed by filtration, the liquid diluted with water, and saturated with carbonate of lime, a faintly acid lime salt of the choleic acid is obtained, from which carbonate of soda separates all the lime, while choleate of soda remains in solution. When this liquid is evaporated and the residue dissolved in absolute alcohol, the excess of carbonate of soda remains, while choleate of soda dissolves. This soda salt in its dry state has the appearance of a colourless gum, or of a slightly yellowish colophony, and possesses all the properties of pure gall; it reacts very faintly alkaline, affords with acetic acid and acetate of lead no precipitate; mixed with a solution of neutral acetate of lead a white resinous precipitate is produced, after the separation of which the liquid has an acid reaction. The addition of basic acetate of lead now produces a fresh resinous precipitate. Dissolved in alcohol no precipitate is produced in the choleate of soda by an alcoholic solution of the neutral acetate or subacetate of lead. Nitrate of silver forms a white precipitate, which is soluble in hot water. On saturating the aqueous solution with hydrate of potash, the choleate of soda separates in the form of a liquid of the consistence of turpentine. Dilute mineral acid causes turbidness and deposition of oily drops, which again disappear with an excess of acid. The sole distinction between the salt and gall is, that the latter is not in any way rendered opaque in the cold by the addition of dilute mineral acids, and only after gentle digestion is choleic acid deposited, which moreover exhibited in both cases many properties in common. From this behaviour it cannot be doubted that the gall is a soda compound of an organic acid, which may be separated from the base, and again combined with the soda to form a salt perfectly similar to the gall.

[To be continued.]

*Observations on Yttria.* By Prof. H. ROSE.

In examining some gadolinites the author had occasion to make some observations which rendered it highly probable that all the yttria which had hitherto been prepared had been contaminated by the oxide of glucinum, and that this circumstance had given rise to the statement that the chloride of yttrium was volatile.

On analysing a so-called Norwegian gadolinite, but which however proved to be true orthite, and contained alumina and only very little yttria, it was found that the precipitated alumina, freed by treatment with sulphate of potash from cerium, &c., still gave up considerable quantities of glucina to carbonate of ammonia. This induced the author to examine the gadolinite from Ytterby, which was said to contain no glucina. It was decomposed with hydrochloric acid, the solution thrown down with ammonia, the precipi-



tate digested in the cold with solution of caustic potash, which however removed no glucina; the precipitate was then melted with bisulphate of potash, extracted with water, washed with sulphate of potash, the solution precipitated with ammonia, the precipitate dissolved in hydrochloric acid, and then tartaric acid, and afterwards ammonia and sulphuret of ammonium in excess added to the solution. The precipitate was dissolved in hydrochloric acid, the sulphuret of iron oxidized by nitric acid, and the yttria thrown down from the solution, nearly neutralized with ammonia, by oxalic acid; in this manner the yttria was obtained free from iron, but some of it remained with the peroxide of iron. The liquid filtered from the sulphuret of iron and yttria was evaporated, the residue heated exposed to the atmosphere, then fused with bisulphate of potash, the mass extracted with water, and the solution precipitated with ammonia. The precipitate obtained afforded, it is true, sweet solutions with acids, and by treatment with charcoal and chlorine gas a sublimate of pure chloride of glucinum, but it was not entirely soluble in a cold solution of caustic potash. It now soon became evident that pure yttria gave not a trace of a volatile chloride on being treated with charcoal and chlorine gas, and consequently that the glucina having become insoluble in potash from its being mixed with yttria, had escaped all former observers.

*Pure yttria* can only be obtained by decomposing gadolinite with hydrochloric acid, separating the silica, precipitating the solution with ammonia, filtering rapidly, edulcorating, mixing the precipitate with carbon, treating it at a strong heat with chlorine gas until nothing more sublimes, extracting the residue with water, precipitating the solution with ammonia, treating the precipitate again with charcoal and chlorine, repeating this operation a third time, and finally adding to the last aqueous solution of the carbonaceous residue sulphuric acid and evaporating, when sulphate of yttria separates in faint rose-red crystals, which subsequently become colourless. The whole of the crystals are fused with bisulphate of potash until the mass no longer fumes; after cooling, the greater part of the sulphate of potash is extracted with a little water. The insoluble portion, when dissolved in much water, afforded a white precipitate with ammonia, which on ignition became brownish-red, and dissolved in hydrochloric acid with a considerable evolution of chlorine; the solution, on the contrary, afforded with a little ammonia a brownish precipitate, which dissolved in hydrochloric acid with a slight disengagement of chlorine. The yttria thus purified was now thrown down by an excess of ammonia as a pure white precipitate, which remained white after ignition and dissolved slowly in hydrochloric acid.

Even this yttria gives a faint rose-red salt with sulphuric acid, but the form of this red salt is quite identical with that of the colourless one. On treating oxide of cerium which contained lanthanum and didymium with charcoal and chlorine, extracting the residue, and then allowing the solution, to which sulphuric acid has been added, to crystallize, a faint reddish salt was also obtained, but of a different form.



The sulphate of yttria examined by Rose had exactly the composition assigned to it by Berzelius; for even had Berzelius's investigations been made with yttria containing glucina, the scarcely-soluble sulphate of yttria would easily have separated from the more soluble glucina-salt. The sulphate of glucina loses its water of crystallization at a faint red heat, and also the sulphuric acid by the long-continued application of heat, but not entirely. The yttria precipitated by ammonia from a solution of this salt always contains sulphuric acid. The solutions of pure salts of yttria have not a decided sweet taste, but are sweetish astringent.

The non-volatile chloride of yttrium is dissolved by water from the charcoal with a hissing noise. Analysis afforded nearly the same composition as that resulting from calculation. Ammonia precipitates yttria from solutions of a white colour, which becomes faintly red by standing and brownish by ignition. Chloride of yttrium is hygroscopic, and subsequently deliquesces. It does not afford a perfectly clear solution in water, probably on account of an admixture of a basic compound. Since the chloride of yttrium is not volatile, and the metallic yttrium hitherto known has always been obtained by potassium from the so-called volatile chloride of yttrium, it evidently follows that this yttrium has been nothing else than glucinum. The author prepared some insoluble fluoride of yttrium from pure yttria and pure fluoric acid, and treated this with sodium. The mass extracted with water was a dark grayish-black powder, which contained however much yttria and very little yttrium. A larger quantity of yttrium was obtained on treating with sodium the chloride of yttrium, prepared by dissolving yttria in hydrochloric acid, evaporating, drying the residue in a current of hydrochloric acid and igniting. There was no evolution of light. The extracted blackish-gray mass dissolved in muriatic acid, leaving behind a carbonaceous residue under evolution of a stinking hydrogen; nothing volatile was obtained by treating it with chlorine, but only a mixture of chloride of yttrium and yttria; it became white on igniting it exposed to the atmosphere.

The yttria formerly prepared contained therefore not only the oxides of cerium, lanthanum and didymium, but also glucinum, and probably some alumina; it was consequently a mixture of at least six oxides, to which has to be added the substance which imparts the red colour to the sulphate.—Poggendorff's *Annalen*.

*Action of Chlorine on Sulpho-cyanuret of Hydrogen and Sulphuret of Ammonium.*

M. Zeise has found that, together with chloride of ammonium and sulpho-cyanuret of ammonium, the same white body is formed which he formerly obtained by treating the above-mentioned ammonium sulpho-salt with acid salts of the peroxide of iron. This white body, which is represented by the formula  $C^2NH^2S^4$ , is called by him hydranzothine.—*Journ. für Prakt. Chem.*, xxix. p. 382.



*On the Combinations of Sulphuric Acid with Organic Substances.*  
By M. GERHARDT.

Certain mineral and organic acids, on combining with neutral or already acid organic substances, produce types of salts in which the properties of the bodies which have entered into combination are no longer to be detected. Among the mineral acids sulphuric acid is that which exhibits the greatest tendency to form compounds of this kind; it unites with every kind of organic matter, with alcohol, with lignine, with starch, with essential oils, with the carburetted hydrogens, and even with organic acids, without the product of the combination presenting the characters of the sulphates. Some years ago I proposed to apply to this kind of combination the term *conjugated*\*, in order to distinguish it from the other forms of combination known in chemistry; the product itself was called *conjugated salt*, and the organic substance which united in this manner with the sulphuric acid without saturating it, received the name of *copula*.

M. Berzelius has adopted these terms, and has even extended them to bodies which do not appear to me to offer any relation to those to which I had applied them. A more minute investigation of the conjugated salts has led me to some general rules, which I will now enumerate.

1. There is scarcely an organic substance which cannot combine with sulphuric acid under favourable circumstances. In this respect I made numerous experiments with bodies of an entirely different nature; at the same time it appeared to me that the slightly-oxygenized bodies, and especially the carburetted hydrogens, most readily underwent this kind of reaction.

Among the oxygenated neutral and volatile substances may be mentioned in this respect alcohol, wood-spirit, oil of potatoes, creosote, valerole (the oxygenated principle of the essence of valerian), &c. When these are mixed with concentrated sulphuric acid they become heated, and on subsequently saturating the mixture with carbonate of barytes or of lime, well-determined salts are obtained, which are soluble in water. Analysis shows that all these products contain the elements of 1 equivalent of organic substance and of 1 equivalent of sulphuric acid, less those of 1 equivalent of water:—



The equivalent of water is eliminated; the product of the combination saturates 1 equivalent of base.



It will be seen that the capacity of saturation of the conjugated salt

\* The French term employed by the author is "*copulé*," which we have rendered into English by "*conjugated*," which gives clearly the author's meaning, and approaches most closely to the German term employed by Berzelius and Wöhler.—ED. *Chem. Gaz.*

† We have preferred leaving the author's notation unaltered in the present instance.—ED.



is *less* than that of the sulphuric acid; in fact this latter is a bibasic acid.

Sulphuric acid . . . . .	$\text{SH}^2 \text{O}^4$ .
Neutral sulphate of potash . . . . .	$\text{SK}^2 \text{O}^4$ .
Acid sulphate of potash . . . . .	$\text{S (HK) O}^4$ .

The sulphovinates, on the contrary, are monobasic. It will presently be seen that this fact is general for all conjugated compounds of this kind.

3. The carburetted hydrogens also combine directly with sulphuric acid; but in order to obtain conjugated compounds, instead of heating the hydrocarburets with the concentrated acid, which in general scarcely dissolves them at the ordinary temperature, it is well to employ fuming sulphuric acid, and even in those cases where the equivalent of the organic substance is very high, anhydrous sulphuric acid. In this manner conjugated salts have been obtained with benzene, naphthalene, cumene, cymene or camphogene, &c.

In this case, as in the preceding one, there is direct combination and elimination of 1 equivalent water. The product is likewise *less basic* than sulphuric acid.

I have obtained similar compounds with the essential oils of turpentine, lemon, pepper, of copahu and of cubeba. These oils did not offer any particularities worth specifying.

When some drops of concentrated sulphuric acid are poured into a large quantity of essential oil of turpentine the mass becomes considerably heated, blackens, and produces, if not kept cool, a large quantity of sulphurous acid; when, on the contrary, the turpentine is added by degrees to a large quantity of acid, a reddish-brown solution is obtained, which evolves much less heat. Water added to this latter mixture separates the isomeric modification of turpentine, which has been described by M. Deville under the name of terebene. The other essential oils behave in a similar manner. With these isomeric modifications it is much easier to obtain a conjugated salt than with the oils themselves. On mixing them with their volume of fuming acid and gently heating, I obtained conjugated combinations similar to the preceding. Terebene for instance gave



On this occasion I noticed another fact, which merits the attention of chemists.

In general the essential oils of lemon, pepper, &c. are considered as proximate principles, carburetted hydrogens; these oils, carefully rectified and dried, always give on analysis quantities of carbon and hydrogen, which, calculated according to the new atomic weight of carbon, never represent the substance employed. They both contain a carburetted hydrogen,  $\text{C}^{10} \text{H}^{16}$ , which however is mixed with a certain quantity of an oxygenated principle, the presence of which occasions a difference of 1.5 to 2 per cent. on the amount of substance employed considered as a carburetted hydrogen. This is easily demonstrated in the following manner:—Take for instance oil of lemon, rectified and dried over fused chloride of calcium, and melt



in it a fragment of caustic potash; this will be surrounded by a kind of sediment of a brown colour and flocculent nature, without the liquid becoming brown. On repeating this operation several times the oil at last is no longer attacked, and it has then an odour of lemon more decided and agreeable.

Potassium is still more favourable for obtaining this result. I dried the oil several times before placing it in contact with this metal; but it lost its metallic lustre, and gave rise to the evolution of some small bubbles of hydrogen. On heating the liquid the disengagement of this gas becomes more considerable. The liquid assumes a reddish-brown tint, and after several rectifications over the potassium is no longer attacked, and then possesses a very agreeable odour of lemons. It is exceedingly probable, according to this, that the essential oils of bergamot, aniseed, orange, &c., those of the *Aurantiaceæ* in general, contain the same carburetted hydrogen, and only differ in odour from the ordinary oil of lemon from their containing some other oxygenated principle. The essential oil of pepper afforded by the same treatment a liquid which had the odour both of lemons and of pepper, but was considerably more agreeable than the crude oil.

Potassium does not attack the pure carburetted hydrogens; it displaces hydrogen only from organic substances which contain oxygen. I believe therefore that it is not correct to consider the essential oils of pepper, lemon, &c., and without doubt many others which figure in works on chemistry as proximate principles, as carburetted hydrogens.

I may add that the chloride of zinc has proved of considerable service in the production of some carburetted hydrogens. I have been able to obtain with its assistance camphogene from camphor with great facility, which leads me to expect that this chloride may be substituted for anhydrous phosphoric acid.

But to return to the subject of the present communication.

4. The organic acids, both fixed as well as volatile, furnish similar combinations. The combinations of sulpho-benzoic acid (Mitscherlich), sulpho-acetic (Melsens), sulpho-cinnamic (Herzog), and sulpho-succinic acids (Fehling), have been prepared and examined.

The volatile monobasic acids are in general but slightly acted on by concentrated sulphuric acid, and even with the assistance of heat; it is therefore preferable to place them in contact with anhydrous acid.

With respect to the fixed acids (tartaric, citric, mucic, &c.), concentrated sulphuric acid dissolves them in the cold after long contact; and if the mixture be heated to from  $194^{\circ}$  to  $212^{\circ}$  F., carbonic oxide is disengaged, and subsequently carbonic acid. The residue likewise contains a conjugated salt. During the saturation of this residue with carbonate of barytes, I have observed in the case of citric acid a considerable disengagement of *acetone*. The reaction, recently investigated by M. Walter, on anhydrous camphoric acid, also comes under this head; but not wishing to enter on a chapter which this chemist is exploring with so much ability, I have con-



finer myself to the study of the conjugated bodies, in *the formation of which no combustion of carbon* takes place. The laws which I have advanced respecting the capacity of saturation only apply to this latter class.

The capacity of saturation of the conjugated products resulting from organic acids is always greater than that of the organic acid; but it is, as in the preceding cases, *less* than the sum of the capacities of the sulphuric acid and of the organic acid which has entered into combination. Thus for instance, when acetic acid, which is monobasic, is conjugated with sulphuric acid, a bibasic compound results. Bibasic succinic acid affords, under the same circumstances, a tribasic compound:—

Acetic acid . . . . .	$C^2 H^4 O^2$ .
Acid acetate of potash . . . . .	$C^2 (H^3 K) O^3$ .
Sulpho-acetic acid . . . . .	$C^2 H^4 O^2, SO^3$ .
Sulpho-acetate of potash . . . . .	$C^2 (H^3 K) O^2, SO^3$ .
Neutral sulpho-acetate of potash . . .	$C^2 (H^2 K^2) O^2, SO^3$ .

5. When the capacity of saturation of conjugated bodies is examined with care, an intimate connexion with those of the substances conjugated will be observed. We have already seen that it is never identical with that of the bodies combined. In fact, by the conjugation of a neutral body with sulphuric acid, a monobasic compound is produced; such is the case with alcohol, wood-spirit, the carbu-retted hydrogens and indigo.

By the conjugation of a monobasic organic acid with sulphuric acid a bibasic compound is obtained. Benzoic, cinnamic and acetic acids afford examples.

By the conjugation of a bibasic organic acid the product is tri-basic. And lastly, by the conjugation of a tribasic organic acid without doubt a quadribasic compound results. In proof of this I have made several experiments with citric acid.

These facts may be expressed in a general way, by stating *that the capacity of saturation of a conjugated compound is constantly less by one unit the sum of the capacities of saturation belonging to the two bodies conjugated*. In fact, on representing the capacity of saturation of a neutral or indifferent body by zero, that of a mono-basic acid by 1, that of a bibasic acid by 2, &c., expressing by  $s$  the capacity of saturation of the conjugated compound, and by  $\Sigma$  the sum of the capacities of the conjugated bodies, we obtain the fol-lowing general formula:—

$$s = \Sigma - 1.$$

6. Phosphoric acid, and the organic acids themselves, combine sometimes with other organic substances, producing conjugated compounds. The basicity of the product presents absolutely the same relations; the oxalovinates, the tartrovinates, the camphovi-nates, are monobasic, for they result from the conjugation of a bibasic acid (oxalic, camphoric or tartaric) with a neutral body, *i. e.* the capacity of saturation of which is zero.

For the same reason the phosphovينات are bibasic, while the



syrupeous phosphoric acid with which they are prepared is tri-basic:—

Phosphoric acid . . . . .  $\text{PH}^3 \text{O}^4$  \*.

Phosphate of barytes . . . . .  $\text{PBa}^3 \text{O}^4$ .

Phosphovinic acid . . . . .  $\text{C}^2 \text{H}^6 \text{O}$ ,  $\text{PHO}^3$ .

Phosphovinate of barytes . . . . .  $\text{C}^2 (\text{H}^4 \text{Ba}^2) \text{O}$ ,  $\text{PHO}^3$ .

This explains *why the monobasic acids are not able to afford conjugated salts by combining with neutral or indifferent substances*; for according to the above law we should obtain in this case  $s = (1 + 0) - 1$ , which would give zero for the capacity of saturation of the product.

It will now be understood why it is impossible to combine either nitric acid, hydrochloric acid, or the organic acids, such as formic, acetic and benzoic acids, with alcohol, and why all the monobasic organic acids, on combining with substances such as alcohol, wood-spirit, &c., only furnish *neutral ethers*, but never *vinic acids*.

7. The facts above expounded lead to very interesting practical applications. They afford the chemist a simple means of determining the equivalent of neutral and indifferent substances, and especially of the carburetted hydrogens. This process is combining the neutral substances with sulphuric acid.

They moreover offer the means of determining the basicity of organic acids, and that also by combining them with sulphuric acid. —*Comptes Rendus* for August 14, 1843.

*On the Phenomena of Digestion, and on the Composition of the Gastric Juice. By M. BLONDLOT.*

In order to obtain the gastric juice in large quantity and in a state of great purity, the author made a permanent artificial aperture on a dog, through which he was able to penetrate direct into the stomach, and to remove at will either gastric juice or the alimentary substances at various periods of digestion. His experiments have been attended with perfect success, and the animal on which the first essays were made two years ago is still living. Although of small size it is able to furnish at a time more than 100 grms. of very pure gastric juice.

He found the gastric juice constantly acid, which was however not due either to lactic acid or hydrochloric acid, but to some acid phosphate of lime. The essentially active principle of the gastric juice is a peculiar organized substance, which behaves after the manner of ferments; its principal characters are to act only in the presence of an acid, and under the influence of a temperature comprised between  $50^\circ$  and  $104^\circ$  Fahr. At some degrees above the highest limit it loses all its action. After having examined the gastric juice as to its chemical composition, M. Blondlot has studied the action which it has on the simple and compound aliments, both in and out

\*  $\text{PH}^3 \text{O}^4$  is the half of  $\text{P}^2 \text{H}^6 \text{O}^8 = \text{P}^2 \text{O}^5 \text{H}^6 \text{O}^3$  of the generally received method of notation.



of the stomach, and under the influence of an artificial temperature.

The nutritive substances are divided into two classes; the one, such as gum, pectine, &c., dissolve in the stomach, and are absorbed by the veins; the others, such as solid albumine, fibrine, and the substance of the various white tissues, are softened, and are reduced into extremely thin particles, to be absorbed by the chyli-ferous vessels. The fatty substances are formed into an emulsion which renders them fit for passing into the chyli-ferous vessels—*Comptes Rendus*, Sept. 11, 1843.

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## ANALYTICAL CHEMISTRY.

*On a new Test for Strychnine.* By E. MARCHAND.

It frequently happens to the chemist, when called upon to give his opinion in a case of medico-legal inquiry, that he meets with difficulties in determining the presence or nature of certain poisonous substances, either from being unable to procure a sufficient quantity of the poison, or from the reactions which characterize it being too little sensitive to offer that degree of precision which admits of deciding with perfect certainty in a criminal case.

Among the organic alkalies hitherto known strychnine is the most poisonous. The discovery of a test which admits of detecting with certainty minute quantities must therefore be desirable and of the greatest importance. I believe I have succeeded in this object by the following process, which is sufficiently delicate to give a very appreciable reaction even when an imponderable quantity of the sulphate of strychnine is operated on.

When a very small quantity of strychnine is triturated with some drops of *a concentrated sulphuric acid containing one-hundredth of its weight of nitric acid*, the strychnine disappears without exhibiting any peculiar appearance; but if to the mixture only an atom of *peroxide of lead* be added, a magnificent blue colour is instantly developed, which passes rapidly into violet, then gradually into red, and terminates after some hours in being converted into canary yellow. This reaction is characteristic of strychnine, for I have hitherto found it impossible to meet with a body which behaved in the same manner under similar circumstances.

When only infinitely small quantities of strychnine are to be operated on, it is preferable, in order to render the action more apparent, to triturate a few particles of the peroxide of lead with the dry alkali, and then to let fall only one drop of the acid liquid on the mixture. The series of coloration described above may then be observed very distinctly, and so as to leave no doubt even when the quantity of strychnine is almost imponderable, and may be approximately estimated at  $\frac{1}{1000}$  of a grain.—*Journ. de Pharm.* for September.



*On the Passage of the Sulphate of Quinine into the Urine, Method of detecting and extracting it. By M. ROBERT.*

M. Bouchardat has made known a valuable test for detecting the presence of the sulphate of quinine in the urine, which has enabled me to ascertain the time which this salt remains in the human body after its reception. This test is the iodated iodide of potassium. I prepared it with 4 parts of iodide of potassium, 1 part of iodine and 10 parts water, for the experiments which I have made on this subject.

The precipitate afforded by the iodated iodide of potassium with sulphate of quinine is very insoluble in water, insoluble in an excess of the reagent, and soluble in alcohol; its colour is yellowish-brown, which is much lighter when formed in a colourless aqueous solution than in urine; in this latter it collects very difficultly, and when there is but a small quantity of sulphate of quinine present it communicates an olive, opaline colouring to the liquor, which is only well distinguished by reflected light. This colour is however very distinct from that which it imparts to urine containing no sulphate of quinine. All the experiments which I have made on the passage of the sulphate of quinine into the urine have afforded identical results, and I shall therefore content myself with selecting two.

*1st experiment.*—50 centigrammes of sulphate of quinine were prescribed for a patient attacked by intermitting fever. He took one third at three o'clock, the second third at five, and the last third at 8 o'clock in the evening. I first examined his urine previous to the administration of the medicine; it afforded no precipitate with the iodated iodide of potassium, and no other coloration than that which is peculiar to the test, and which it imparts to all liquids in which it is dissolved. At six in the evening his urine afforded a considerable precipitate (he had already taken 33 centigrammes of the sulphate of quinine in two portions); the same result was obtained with that passed at nine o'clock; that passed at five the next morning still gave a very decided opalescence, but that at twelve did not show any trace of the presence of sulphate of quinine any more than that which he voided in the following twenty-four hours; after which he took another dose of the sulphate of quinine, which forms the subject of a second experiment.

*2nd experiment.*—50 centigrammes of sulphate of quinine were administered in three portions to the same patient, one third at twelve, the next at six, and the last at eight o'clock in the evening. His urine, examined at one o'clock, at two and at six in the evening, showed no sign of the presence of the sulphate of quinine; but that passed at eight o'clock afforded a very considerable precipitate with the iodated iodide of potassium; that of the next morning at five gave a very distinct precipitate, but that at twelve only a slight opalescence visible by reflected light; that passed at six in the evening still gave, when seen by reflected light, a slight olive and opaline coloration, indicating the presence of a minute quantity of sulphate of quinine in the urine.



From these experiments, and others that I do not mention, it results,—1st, that the sulphate of quinine administered internally enters into the circulation and passes into the urine; 2nd, that it may be detected by the iodated iodide of potassium one hour after its reception, if it has been taken in a dose of at least 30 to 35 centigrammes; 3rd, that it passes very slowly into the urine, since its presence may be detected by the same test twenty-four hours, and even more, after its injection, if taken in a dose of 45 to 50 centigrammes.

I wished to ascertain whether the iodated iodide of potassium would not afford an easy means of reobtaining the sulphate of quinine from the urine of patients submitted to this treatment; for this purpose I employed the two following processes, with both of which I succeeded:—

*1st process.*—I took the combined urine of two patients who had each taken 50 centigrammes of sulphate of quinine; it was passed within twelve hours after the reception. I treated it with the test, and obtained a precipitate, which was collected on a filter, washed with distilled water, and then treated with dilute sulphuric acid, which decomposed the double iodide of potassium and quinine, forming sulphate of potash and sulphate of quinine, and precipitating the iodine. The filtered liquid was treated with ammonia, which precipitated the quinine, which was redissolved in dilute sulphuric acid until the liquid had a slight acid reaction; it was then decolorized by charcoal and evaporated at a gentle heat, when it furnished beautiful crystals of the sulphate of quinine.

*2nd process.*—I first operated as above, but instead of precipitating the quinine by ammonia, after having dissolved the precipitate in sulphuric acid, I evaporated to dryness and treated the residue with alcohol, which dissolved out the sulphate of quinine, and left undissolved the sulphate of potash. From the alcoholic solution decolorized with charcoal I obtained on evaporation the sulphate of quinine in crystals.

I greatly prefer the first of these processes, because in the second it is very difficult to fix upon the point of saturation of the sulphuric acid which is employed to decompose the double iodide, and an excess of the acid may decompose the quinine, if too strong a heat be given towards the end of the first evaporation, or prevent it from crystallizing if it pass into the alcoholic solution.—*Journ. de Pharm.* for September.

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## PHARMACOLOGY.

*Observations on Fucus amylaceus (Sphærococcus lichenoides, Ag.).*  
By MM. WONNEBERG and KREYSSIG.

For the purpose of examination a quantity was cut into small pieces, boiled in water and strained, when it afforded a very slimy liquid, a portion of which mixed with absolute alcohol immediately



gave a flocculent precipitate of *pectine*, which increased by long standing.

Another portion of the liquid was mixed with tincture of iodine: when only a small quantity is added it has no apparent action, but with a larger dose the liquid is coloured faintly bluish-green. A cross section of softened fucus was however, on being moistened with tincture of iodine, immediately coloured blue, showing that the starch occurs more in the cellular tissue, and is only dissolved when the fucus is finely pulverized and treated with warm water.

Hydrochloric acid produced in another portion of the liquid a flocculent precipitate of gum.

5 grs. of comminuted fucus afforded on boiling with 2 oz. of water  $1\frac{1}{2}$  oz. of slimy decoction and 1 oz. of gelatine. After each boiling of the residue we always obtained slimy decoctions, which on cooling solidified to a gelatine; when, on the contrary, the fucus is reduced to a fine powder and boiled with water, it dissolves almost entirely, with the exception of a small quantity of woody fibre, and affords not only very slimy decoctions but also a very considerable quantity of gelatine. We therefore recommend the employment of the fucus in the form of a powder in the same manner as *Rad. salep*.

Its odour calls very distinctly to mind that of sponges, which induced us to test it for iodine; accordingly a portion of the slimy decoction was mixed with an excess of starch and gently heated, but no reaction was apparent even after long standing. On the addition of chlorine water however, and especially when the decoction contains some undissolved parts of the fucus, a faintish blue colouring is evident. The fucus contains therefore iodine, not in an isolated state, but in a state of combination.

A portion of the fucus was now burnt on platinum foil, the residue treated with water, filtered, and a portion of the solution mixed with oxalate of ammonia, which immediately gave rise to a considerable white precipitate of oxalate of lime. A large quantity of oxalate of ammonia was now added until a filtered sample was no longer rendered opaque on the fresh addition of oxalate of ammonia, the oxalate of lime removed by filtration, and the solution tested for magnesia with phosphate of ammonia and caustic ammonia; a white precipitate proved the presence of some magnesia; the liquid was filtered from the precipitate and evaporated on platinum foil, when it left a residue which, dissolved in water and mixed with a solution of platinum, afforded a yellow precipitate of potassio-chloride of platinum. The liquid was now filtered from the chloride of platinum and potassium, and sulphuretted hydrogen passed into the solution to remove any excess of platinum, the vessel covered, and after a time the liquid filtered from the sulphuret of platinum and evaporated, when it left soda behind.

Another portion of the liquid was mixed with chloride of barium, which gave rise to a precipitate insoluble in water, in muriatic and in nitric acid, indicating the presence of sulphates.

Nitrate of silver produced a white precipitate, which was partially



soluble in ammonia, showing therefore the presence of chlorides and phosphates.

Another portion of the fucus was treated at a gentle heat with hydrochloric acid, the liquid filtered, neutralized, and some sulphuretted hydrogen water added, which gave rise to a faintly-black colouring.

The essential constituents of the *Fucus amylaceus* are therefore pectine, gum and starch; it moreover contains a pretty considerable quantity of sulphate of lime, traces of phosphate of lime, sulphates of potash and soda, iodide of potassium, chloride of magnesium, peroxide of iron, and woody fibre.—*Allg. Pharm. Zeitschr.* von Artus, Part i. p. 4–8.

*On Tsantjan, or Kanten. By Dr. BLEY.*

The *Tsantjan*, or *Kanten*, of which I send you a specimen, is, according to a communication of the celebrated traveller Dr. Siebold of Leyden, a preparation of a sea alga (*Fucus cartilagenosus*) which is consumed in Japan as a substitute for the edible birds' nests, and is exported as an article of commerce to China. It is administered in the form of a jelly in Japan and China as a remedy for diseases of the lungs and other cachectiæ, and affords much relief.

The sample sent has the form of twisted isinglass, 4 to 5 inches in length, is of a yellowish-white colour, and probably consists of pectine and salts of pectic acid.—*Extract from a Letter of Dr. Muller to Dr. Bley, Ann. der Pharm.* for July.

*Iodine in Nasturtium aquaticum. By Dr. MULLER.*

From the remarkable smell of the fresh herb I was induced to submit it to chemical examination. Several ounces of the fresh herb were burnt to ash, which were well extracted with distilled water; sulphuric acid was added to the solution, but not sufficient to destroy entirely its alkaline reaction; the mixture was then evaporated nearly to dryness, the residue mixed with alcohol, in order to separate the sulphate of potash which had formed, and the filtered solution evaporated to dryness. The residue, treated with nitric acid and starch, afforded the characteristic blue colour of iodide of starch, and mixed with phosphate of soda and oxide of copper imparted to the flame of the blowpipe the well-known green colour of iodine, and at the same time the blue one of chlorine.—*Ann. der Pharm.* for July.

## CHEMICAL PREPARATIONS.

*Aërated Sea Water of M. PASQUIER.*

M. RAYER expresses the following opinion in a Report read before the French Academy of Medicine on an aërated sea water prepared by M. Pasquier:—



Long since the inhabitants of the sea-coast have employed salt water either as a purgative or as a relaxative. Several physicians, and especially Russel, have written on the advantages which might be derived from its internal use. But the experiments have been few in number, and entirely limited to localities situated near the coast, because the sea water could not be preserved and transported without undergoing alteration. M. Pasquier has, by overcoming this difficulty, rendered great service to therapeutics. Being moreover convinced that the disagreeable taste of the sea water was the principal cause which prevented its general use, he has endeavoured to disguise and to destroy it, without in the least altering its chemical composition.

For that purpose he takes his sea water from a certain depth and at several miles distance from the coast; he then filters it, in order to remove all the animal and vegetable substances which it holds in suspension, and which are the cause of its rapid decomposition; and lastly, he charges it with carbonic acid gas, in order to destroy the disagreeable taste. One hundred bottles thus prepared by M. Pasquier were placed at the disposal of the Commission; they had been kept from four to six months, and we found that they had undergone no change whatsoever.

Being requested to verify the exactitude of the facts stated by M. Pasquier, I have employed sea water prepared by him in the *Hôpital de la Charité*, and I have been able to confirm,—1st, that it is a powerful purgative; that a bottle of sea water purges more strongly than a 32-grms. bottle of Seidlitz water; 2nd, that the patients took it without repugnance, and found it agreeable to the taste; 3rd, that no accidents, no inconveniences have resulted from its employment.

We consequently believe that the purified and aërated sea water prepared by M. Pasquier may be employed with advantage in all cases where saline purgatives are recommended. We have moreover observed that it has a special and favourable action on individuals affected with scrofulous diseases.—*Journ. de Pharm.* for September.

*Easy Method of preparing pure Zircona.* By Prof. TH. SCHEERER.

When pulverized and suspended zircon is mixed, according to Wöhler's directions, with four times its weight of carbonate of soda, and the mixture fused in a platinum crucible, a solution of silicate of soda and carbonate of soda are obtained on treating the melted mass with water, which contains in suspension flakes of peroxide of iron, oxide of manganese, and some other substances. On the bottom of the glass containing the solution there will also be observed a considerable quantity of a very heavy, white, sandy powder, which might easily be taken for undecomposed zircon. On closer examination however it will prove to be a crystalline compound of zircona and soda. It is therefore only requisite to decant the supernatant liquid after having well stirred it, in order to suspend the lighter oxides,



and to repeat this process a few times in order to isolate the zircona-soda. It may then be brought on to a filter andedulcorated, which however must not be continued too long, as the combination is gradually decomposed by pure water, and a portion of the zircona separates in the form of the modification which is insoluble in acids. When the zircona-soda is treated with hydrochloric acid, the mass becomes much heated and swells considerably, but without any evolution of gas. If after a time water be added, a very clear solution is obtained, from which perfectly pure snow-white hydrate of zircona may be separated by precipitation with solution of ammonia and edulcoration with water. It is possible that the formation of this compound of zircona and soda has led to the belief that a very intense heat is required in order to decompose zircon by fusion with carbonate of soda. The combination of the zircona with the soda appears to result at a red heat, or at least at a temperature far below white heat.—Poggendorff's *Annalen*, No. 7, 1843.

### *Oleum Hyoscyami Coctum.*

For preparing this oil, take of the recently dried herb 1 lb., cut into small pieces, pound well in a mortar with just sufficient rectified spirits of wine to moisten the herb, digest this mass in a closed vessel for several hours, then add 3 lbs. of olive oil, and boil in an iron or porcelain vessel, and strain through linen. Digest the residue with another pound of olive oil, and press as before; filter the mixed oils through blotting-paper, and preserve in a well-stoppered bottle. It has an intense green colour, is applied externally, and is said to possess anodyne narcotic properties.—Mohr's *Pharmacopœia Universalis*.

### *Unguentum Hyoscyami.*

When *Ol. Hyosc. coct.* is combined with *Ung. mercur.*, *Linim. volatile*, *Tinct. Opii*, &c., it again separates after a time and becomes thick; if it is mixed in considerable quantity with *Ung. mercur.* the mercury separates at the bottom of the vessel. Gauger therefore advises the preparation of the following unguent instead of the *Ol. Hyosc. coct.*:—℞ *Cer. flav.* lb. j. ℥ j j j.; *Ol. oliv.* lb. xiv. ℥ ix.; *solutis leni igne adde herb. Hyoscyam. nigr. concis.* lb. j j.; *macera per aliqu. horas in vase vitreo s. cupreo bene stannato, tum decoque per horam quadrantem, cola, decanta, et in vitro clauso loco frigido serva.* The salve is sufficiently fluid to be employed alone, like *Ol. Hyosc.*, but is far superior for mixtures; it may be combined in equal parts with *Ung. mercur.* without anything separating.—Gauger's *Rep.*, 1842, p. 656.



## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*Alkalimetry.*—On a new, simple and accurate Method of ascertaining the Commercial Value of Potash and Soda. By MM. FRESSENIUS and WILL.

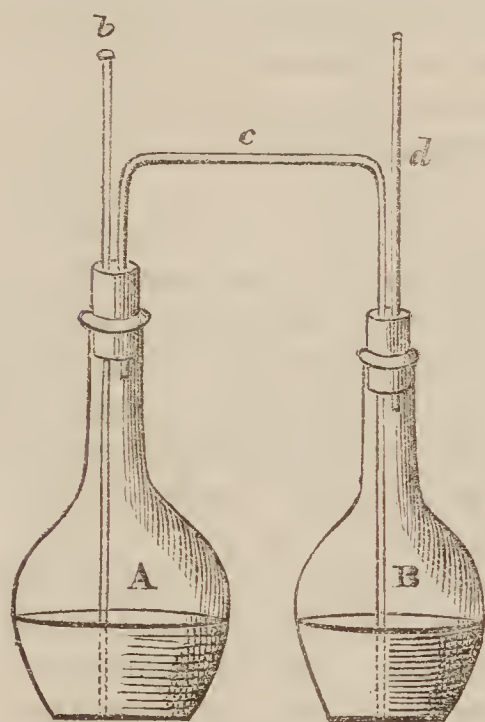
THE various methods for ascertaining the amount of *potash* and *soda* contained in commercial pearlash and soda, or rather the *carbonate* salts of these bases, have been collectively termed *alkalimetry*. Their importance in commerce, to manufacturers and consumers, has induced many chemists to direct their attention to this subject. All have however followed the same principle, that first laid down by Descroizelles, of which the methods of Gay-Lussac and other chemists are only modifications, having for their object to render the execution of the operation more easy and the results more certain.

The conditions requisite for the success of these methods may easily be satisfied by careful manipulation, correct apparatus, practice and patience, when the potash or soda to be tested are not mixed up with salts or impurities which neutralize the sulphuric acid in the same manner as the carbonate alkalies. But salts of this kind are always contained, to a greater or less amount, in all ashes of plants, and especially in artificial soda; in the former these consist of alkaline silicates and phosphates along with carbonates, silicates and phosphates of the alkaline earths; in the latter of sulphite and hyposulphite of soda, sulphuret of sodium, and in the crude soda moreover of carbonate of lime and sulphuret of calcium. The insoluble salts of the earths may be easily removed by treating the sample with water and filtering, but the separation of the soluble salts is either very difficult (those sodas which contain sulphites or alkaline sulphurets must, before they can be tested, be fused with chlorate of potash) or quite impossible; such is the case when the impurities consist of hyposulphites, silicates and phosphates. The presence of these salts, when they occur in any quantity, renders the examinations of potashes and sodas by the methods hitherto in use far from accurate; the per-centage amount of carbonate alkalies in the pearlashes and sodas is always indicated too high, to the disadvantage of the buyer. The importance of this objection will be most clearly evident from the fact, that most of the commercial sodas contain such amount of sulphite and hyposulphite of soda that only approximative results can be obtained with the methods hitherto in use (sometimes 3, 4, 6 and more per cent. too much), a circumstance which increases in importance, as the artificial soda has now nearly driven that obtained from plants entirely out of the market.

The mode of testing which we have adopted, and which we will now describe, is founded on a principle not less simple than the old method, but is exactly the reverse of it. To find the amount of a compound body the constituents of which are in a known, definite and invariable proportion, it is not requisite to determine the amount of all the constituents; a knowledge of the quantity of the one or of



the other allows of finding out the amount of the whole. The object of the examination of potashes and sodas is the determination of the carbonated alkalies contained in them. According to the old method, the amount of *alkali* was determined by measuring off the acid required for neutralization; in our method it is the carbonic acid which is in combination with the alkalies which is determined. For this purpose we have constructed a new apparatus, in which the drying of the carbonic acid is not effected as in former ones by means of chloride of calcium, but in the most simple manner by the same sulphuric acid which expels the carbonic acid from its combinations. It admits of a considerable quantity of substance being decomposed, and there need be no fear of having employed too little acid. The water is absorbed more completely than with chloride of calcium, and it is not requisite to employ heat, as the sulphuric acid itself performs this office. The accuracy and constancy of the results, even with an ordinary balance, and the ease with which the results may be obtained by every one, have far exceeded our expectations; and lastly, the apparatus is so simple that it may readily be constructed by any person, as will be evident from the annexed woodcut.



A and B are two wide-mouthed bottles, of which A contains from 4 to 5 oz. of water; B is of somewhat smaller capacity (from 3 to 4 oz.). These vessels are closed with corks, each of which is bored twice, and into which the glass tubes *b*, *c* and *d* are fitted in the manner shown in the woodcut. The extremities of all the tubes are open; when in use the tube *b* is closed at its extremity with a piece of wax. A weighed quantity of the substance is conveyed into A, which is then filled one-third with water; B is filled one-half with ordinary sulphuric acid. The corks are now fitted into the apparatus, which is then weighed. Some air is sucked out by the tube *d*, in consequence of which the air in the entire apparatus becomes dilated,

and the sulphuric acid in B ascends the tube *c*, and a portion flows over into A; but as soon as this comes into the solution of the carbonate salt a violent evolution of carbonic acid gas ensues. This, from the arrangement of the apparatus, is forced to pass through the sulphuric acid in B before it can escape through the tube *d*, the only opening in the apparatus, and in its passage all moisture is perfectly absorbed and retained. When the sulphuric acid reaches the liquid in A, this becomes hot and expands, and also the air above it; on cooling, both reassume their original volume; and the result is, that a fresh portion of sulphuric acid flows into A as



soon as the evolution of gas ceases; this is moreover assisted at the commencement of the operation by some of the carbonic acid contained in A being absorbed by the still undecomposed carbonated alkali. However, to save time, it is far more simple, each time after evolution of gas has ceased, to draw more air through the tube *d*. In this manner the operation may be finished in a few minutes. When the carbonate salt is entirely decomposed, which is immediately seen from no more evolution of gas resulting on the addition of fresh acid, a somewhat large quantity of the sulphuric acid still contained in B is made to pass over into A by suction, which heats the liquid so much that the whole of the carbonic acid which had been absorbed escapes. When all evolution of gas has ceased, the wax is removed from the end of the tube *b*, and air drawn through at *d* until the whole of the carbonic acid with which the apparatus was filled is replaced by air. The apparatus is then allowed to cool, wiped dry and weighed. The loss in weight indicates the amount of carbonic acid which was contained in the sample with the greatest accuracy, and from this the amount of carbonated alkalies contained in the pearlash or soda may be easily ascertained, as will be subsequently shown.

Before proceeding to describe the details in the practical execution of this method, we will take into consideration the influence which the foreign salts, such as chlorides, sulphurets, sulphites and hyposulphites, have when the above apparatus is employed for determining the value of commercial potash or soda. The presence of chlorides gives rise to no error, as from the diluted state of the solution of the sample not a trace of the liberated muriatic acid escapes. The injurious effects which would result from the presence of sulphurets, sulphites and hyposulphites, are easily obviated by adding a small quantity of neutral chromate of potash to the solution of potash or soda under examination. Both the sulphurous acid and the sulphuretted hydrogen are decomposed on their liberation into water and sulphur, with formation of sulphate of the oxide of chromium, all of which remain in the solution.

The sources of error arising from the presence of foreign salts are therefore easily obviated; but there is still one other circumstance which must be taken into consideration. Can the commercial value of pearlash and soda be actually determined with accuracy from the ascertained amount of carbonic acid, or is the amount of carbonic acid in the soluble parts of the pearlash and soda in proportion to the quantity of alkali which is rendered caustic by treatment with lime (which consequently determines their value), in a definite and constant proportion, or is it indefinite and varying?

Were the latter view correct, then the new method would be false in principle; if, on the contrary, the proportion is constant and invariable, or, in case it is not, can be rendered so, then we can conceive of no objection that can be made to our mode of examination.

Pearlash and soda are universally considered to contain neutral carbonate of alkali; opinions contrary to this have been recently asserted by some chemists. According to one statement, the car-



bonic acid is said to be sometimes in smaller proportion to the alkali than in the neutral carbonate; according to others, it is sometimes higher. According to some, many potashes and sodas contain caustic alkali together with the neutral carbonate; according to others, bicarbonate, sesquicarbonate, &c. We have examined into the truth of these statements, and have shown how the injurious influence of these anomalies may be obviated. But there is one source of error which our method has in common with all the others; it is that carbonate of soda, supposing it to be present in pearlash, is calculated as carbonate of potash, and *vice versâ*. If however it is a question only of the definite equivalents of alkali, which are to be employed as it were merely as the bearer of a force to produce certain chemical effects, then a perfectly correct result is obtained; for by so much the smaller the equivalent number of soda is to that of potash, just that quantity of potash is brought into calculation instead of soda. Or, in other words, we may say that the carbonic acid is proportional to the force and effect of the potash as well as of the soda, or of a mixture of the two.

With respect to *caustic potash*, this certainly occurs in the North American pearlashes, but we have never been able to detect it in the Illyrian, Bohemian and German kinds. *Caustic soda* occurs very frequently in the commercial sodas. The method of detecting these and ascertaining their quantity will be subsequently described.

*Bicarbonate*, or rather *sesquicarbonate of potash or soda*, is formed in pearlash and soda by the absorption of carbonic acid from the atmosphere, when they are exposed for a long time in contact with the air. We have found its quantity, in our experiments, to be generally very small, in most cases scarcely to be detected. To ascertain its presence, the solution of the pearlash or soda is treated with solution of chloride of calcium in excess, filtered, and ammonia added to the clear liquid, which will become immediately turbid if it be present. It has however no influence on the result, for it is converted by a gentle heat into the neutral carbonate; and according to our method the sample is always heated before being tested.

Herrmann has recently denied the accuracy of the generally-received opinion, that the sesquicarbonate or bicarbonate of potash is converted by ignition into neutral salt. Numerous experiments and analyses which we have made have proved the incorrectness of his results. Our experiments showed, in fact, that no combination containing more carbonic acid than the neutral salt could exist at a high temperature.

#### *Special Directions for examining Pearlash and Soda.*

To estimate accurately the commercial value of pearlash and soda, we must determine their amount of water and the quantity of the carbonated alkali. In the first place, it is, however, requisite to ascertain whether they contain any caustic alkali, sulphites or hyposulphites, sulphurets or earthy carbonates, in order that the injurious influence which they would have on the result of the examination may be obviated.



1. *Carbonates of the Alkaline Earths*.—A sample of the pulverized potash or soda is treated with hot rain-water; it should dissolve entirely; if a white powder remain behind which effervesces with acids after edulcoration, it will indicate the presence of carbonate of lime or carbonate of magnesia. In this case the weighed sample must be treated with hot rain-water, the solution filtered, the residue well washed, and what has passed through, after having been somewhat evaporated, is brought into the bottle A.

2. *Sulphites and Hyposulphites*.—These salts occur only in soda, never in potash. Their presence is most readily detected by colouring about 2 oz. of dilute sulphuric acid reddish-yellow with some chromate of potash, and then adding some of the soda to be tested, with this precaution, however, that the liquid always remains acid. If the reddish-yellow colour is converted into green, then the above salts are present. Sulphuret of sodium gives rise to the same change of colour, but wherever this is found it may be admitted with certainty that hyposulphite of soda is also present. The alkaline sulphurets are most easily detected by moistening the potash or soda with a solution of common (sesqui) carbonate of ammonia. When they are present sulphuret of ammonium is given off, which is easily recognized by its smell and its property of blackening paper moistened with solution of acetate of lead. When either one or the other of these mixtures is present, a small quantity of neutral chromate of potash is added in the determination of the carbonic acid.

3. *Caustic Potash and Caustic Soda*.—1 part of the pearlash or soda under examination is mixed with about 3 parts chloride of barium and treated with hot water, well stirred, and some of the filtered liquid tested with dahlia or curcuma paper. If the former becomes green or the latter brown, caustic potash is present. It need hardly be mentioned that the chloride of barium should be perfectly neutral, and that it should be in excess; of this it is easy to be convinced by adding to the filtered solution some more chloride of barium, which should give rise to no further precipitate. This mode of testing deserves the preference to all others, on account of its simplicity and certainty. If sulphuret of potassium or of sodium, which would likewise cause an alkaline reaction, is present, it is unnecessary to test for the caustic alkalies, for we may be certain that they are then present.

In case caustic alkali should be present, the sample weighed off for the determination of the carbonic acid is rubbed up with 3 or 4 parts of quartz-sand, and from one-fourth to a third of the amount of sample of pulverized carbonate of ammonia mixed with it; the powder is brought into a porcelain dish, and so much water dropped on the mass as it can absorb; it is allowed to stand for a time, and then heated until the whole of the water and carbonate of ammonia are expelled. If the potash or soda contain, besides caustic alkali, an alkaline sulphuret, then solution of ammonia should be employed to moisten the mass, in order to convert the sesquicarbonate of ammonia into neutral salt, otherwise sulphuret of ammonium would be disengaged and a portion of the alkaline sulphuret be converted into



carbonate. When cooled the mass is brought into the vessel A, the dish washed with some water, and proceeded with as described below. The sand serves to prevent the caking together of the mass, and also any loss in the drying.

For determining the amount of water of the pearlash or soda, a small crucible of iron or porcelain is placed with its lid on the one plate of a common but accurate hand-scale, which is then loaded with a 10-gramme piece, and the balance brought by means of shot and tinfoil into equilibrium. Samples are now selected from various parts and pulverized, the 10-gramme piece removed from the balance, and in its stead powder conveyed into the crucible until equilibrium is perfectly established. In this way we have exactly 10 grammes of potash or soda in the crucible.

This is now heated over a good spirit-lamp until the whole of the water is expelled, and after cooling is brought on to the scale, when the number of decigrammes which must be added to restore equilibrium will indicate the per-centage amount of water.

6.29 grms. of the anhydrous pearlash thus obtained are weighed off, but of the anhydrous soda ash 4.84, and conveyed into the bottle A of the apparatus, which is then filled above one-third with water\*. The apparatus is now arranged, dried and weighed, and some sulphuric acid caused to pass by slight suction at *d* from the vessel B into A†. After complete decomposition the wax stopper at *b* is removed, and air drawn through the apparatus, in which operation a tube filled with moist hydrate of lime may be employed if the taste of the carbonic acid is found to be disagreeable; it is then cooled, which may be hastened by immersion in cold water, dried, placed on the scale, and weights substituted for the carbonic acid which has escaped.

The number of centigrammes which have to be added to the apparatus to restore equilibrium divided by 2 gives directly the percentage amount of anhydrous carbonate of potash or soda. Suppose for instance with 6.29 grms. pearlash the apparatus had lost 1.60 grm. in weight of carbonic acid, then it would contain  $\frac{1.60}{2} = 80$  per cent. of carbonate of potash.

The determination of the amount of caustic soda or potash which may be contained along with the carbonated alkalies in pearlash or soda ash is not only important in a commercial point of view and to the manufacturer, but is of considerable scientific interest. Our alkalimetric method affords the simplest means of ascertaining this.

According to whether it is pearlash or soda, 6.29 or 4.84 grms. of the anhydrous residue are weighed off twice; the one portion is employed to determine the carbonic acid direct, the other after previous treatment with carbonate of ammonia. From the difference in the weights obtained the amount of caustic potash will be found by multiplying it by 34.101; for soda it must be multiplied by

\* Some neutral chromate of potash is added to the water in the case of soda, or a solution of bichromate of potash saturated to excess with ammonia.

† The first drops of the concentrated sulphuric acid produce a violent evolution of gas, which has however not the least influence on the result.



29·38 in order to find the per-centage of caustic soda. The authors then detail a numerous series of experiments, made with a view to determine the accuracy of their method both with commercial sodas and pearlashes, as well as with some prepared kinds in which the amount was accurately known. The three following examples will suffice :—

1. *a.* 4·84 grms. of a mixture of equal parts of anhydrous carbonate of soda and anhydrous sulphate of soda afforded 1·002 gram. carbonic acid.

*b.* 3·185 of the same mixture saturated 57·5° of Gay-Lussac's testing acid.

*c.* 3·185 saturated in a second experiment 58·4°.

2. *a.* 4·84 grms. of a mixture of 2 parts of carbonate of soda and 1 part sulphate of soda gave 1·33 gram. carbonic acid.

*b.* 3·185 saturated 80° testing acid.

*c.* ... 79·5° ...

*d.* ... 79° ...

3. *a.* 4·84 pure crystallized soda gave 0·745 gram. carbonic acid.

*b.* ... 0·753 ...

*c.* 3·185 pure crystallized soda saturated 46° testing acid.

*d.* ... 45° ...

100 parts of the analysed mixtures contain therefore of anhydrous carbonate of soda—

	According to our method.	According to Gay-Lussac's process.			Calc.
1.	50·1	48·9	49·7		50·0
2.	66·5	68·1	67·7	67·3	66·6
3.	37·2	37·6	39·1	38·2	37·2

[The authors have also applied this method to the testing of acids and manganese, and promise details in a subsequent Number of the 'Annalen der Chemie und Pharmacie,' which we shall immediately transfer to our pages.—*Ed. Chem. Gaz.*]

## PATENTS.

*Patent granted to William Maugham, Lambeth, for an Improvement in preparing Aërated Water.*

THIS process consists in making an aërated water, containing lime in the state of what is known by chemists as supercarbonate or bicarbonate of lime, and is effected by passing carbonic acid gas through a solution of caustic lime in water, the said solution being under pressure during the period it is being impregnated with the carbonic acid gas. Over and above the quantity of carbonic acid necessary to form super or bicarbonate of lime, the water holding such salt in solution is to be further highly charged with carbonic acid gas, so as to possess in an eminent degree a sparkling property, resembling in this respect soda and other well-known aërated waters.

That the mode of proceeding may be fully understood, it is to be observed, that to succeed in manufacturing the article under con-



sideration, the refuse chippings or pieces of white Carrara marble, left by statuaries or marble masons are employed, and these placed in a crucible perforated with a few holes, which is then to be inserted in a furnace, so that the marble may be submitted to a full red heat, after the manner in which ordinary limestone is burned for making mortar. The carbonic acid is thus expelled from the marble by the heat employed, and if the proper quality of marble has been selected, very pure caustic lime remains, which is to be dissolved in water in the proportion of 1 lb. of lime to 2 gallons of water; and for this purpose a vessel of sufficient capacity should be employed and well covered, so as to exclude the solution of lime, which is formed from the external atmosphere, because a solution of lime in water rapidly absorbs carbonic acid from the atmosphere, and is again converted into carbonate of lime. According to Mr. Richard Phillips, as stated in a note in his translation of the 'London Pharmacopœia,' 1 pint of water at 60° Fahr. will dissolve  $11\frac{6}{10}$  grs. of lime.

An excess of lime is of no consequence, as it will remain undissolved, and can be used for another occasion. The reason for not using other varieties of marble or limestone is, that on account of the impurities which they contain they are apt to impart an unpleasant flavour to the aerated liquor. After the lime is added to the water, which is to be used cold, the mixture should be well stirred or agitated for a few minutes, so as to thoroughly effect the slaking of the lime, and bring the particles of lime in contact with those of the water, and then the whole should be allowed to stand, so that any undissolved portion of lime may subside. When the lime-liquor is clear (though there will always be a pellicle on the surface), it may then be drawn off by a cock placed a few inches above the undissolved lime at the bottom of the vessel, and as it is drawn off it will be better to pass it through a filter, for with the greatest care some particles of lime undissolved, or carbonate of lime, will be found floating in the solution, which ought to be perfectly clear. No particular kind of filter is recommended, one that is efficacious being all that is required. The lime-liquor might be passed through a layer of clean sand mixed with charcoal. In the experiments which have been made under the direction of the patentee, the lime-liquor has been merely passed through coarse filtering-paper, such as druggists are in the habit of using; but this mode of proceeding would be too slow and tedious on the large scale. The filtered solution of lime is to be kept in a proper vessel excluded from the atmosphere, and is then ready for use. To obtain the aerated liquor it is only necessary to pass the lime-liquor into a sufficiently strong and properly-closed vessel, and charge it with carbonic acid gas under a sufficient degree of pressure. It is considered unnecessary to describe any particular form of apparatus for effecting this object, as the machinery employed for making soda water, as it is called commercially, and other aerated waters, is all that is required to complete the operation, provided the pressure be sufficient to force in the requisite quantity of carbonic acid gas, so that the lime in the lime water, which by this operation is at first



converted into carbonate of lime, and next into what is known by chemists under the name of super or bicarbonate of lime, may be held thoroughly in solution in water in the latter state, and that the water may be further highly charged with carbonic acid in excess, so as to possess the sparkling properties of an aërated water in a very eminent degree. This extra charging with carbonic acid gas will entirely depend on the pressure employed. It is well known that in machinery employed by soda water manufacturers, and the manufacturers of aërated waters in general, such machinery enables the manufacturer to increase or diminish the pressure upon the carbonic acid and the liquid to be impregnated therewith at will, so that in well-constructed machinery of this kind the manufacturer has it in his power to make the aërated liquor, according to this invention, under the most favourable circumstances. Unless a sufficient degree of pressure be used, the aërated liquor will have a somewhat unpleasant flavour. A greater degree of pressure is used than what is usually employed for making soda water. The aërated liquor, thus prepared, is next to be drawn off into strong bottles, after the manner in which soda water is bottled, and secured with corks fastened down with wire, or any other suitable material, when it is ready for the market.—Sealed January 31, 1843.

*Patent granted to James Young, Newton-le-Willows, Lancaster, for certain Improvements in the Manufacture of Ammonia.*

The improved mode of manufacturing ammonia consists in filling a vertical retort with a mixture of two parts by weight of the substance called guano, and one part by weight of hydrate of lime or other caustic alkali. These substances are thoroughly mixed by giving a rotary or reciprocating motion to the agitator, and then the retort is subjected to a moderate degree of heat, which is gradually increased until the bottom of the retort is red-hot. By this means the ammonia is set free, and the uric acid contained in the guano being decomposed yields ammonia also; but as other gases are liberated besides the ammonia, it is separated from them by passing the whole of the gaseous products through the pipe into the condenser. The condenser consists of an oblong vessel of iron, lead, stone, or other suitable material, the top of which gradually ascends from the entrance- to the exit-pipe; it is filled with water, and at the lower end is a bridge finely perforated, for the purpose of causing the gases to distribute themselves through the water. The ammonia is absorbed by the water, but the other gases, which are insoluble, make their escape through a pipe.

If it be found requisite, the condenser may have one or two inclined shelves within it, which may be fluted on their under surfaces.

Solutions of carbonate, bicarbonate, or sesquicarbonate of ammonia are produced by filling the condenser above mentioned with a solution of ammonia, and passing carbonic acid through it.

A solution of sulphate or muriate of ammonia is obtained by filling the condenser with diluted sulphuric or muriatic acid, and passing the ammonia through it as it issues from the retort.—Sealed Nov. 11, 1841.



# THE CHEMICAL GAZETTE.

No. XXIV.—October 16, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Products of the dry Distillation of Dragon's Blood.*

*By* MM. GLENARD and BOUDAULT.

DRAGON'S blood submitted to the action of heat first melts and gives off an acid liquid, which distils over at  $410^{\circ}$  Fahr.; above this temperature the mass puffs up and undergoes decomposition, carbonic acid and carbonic oxide being given off. Thick white fumes become evident, and condense in the receiver, in which also collects an oily liquid of a red colour; a somewhat considerable quantity of carbon remains in the retort. The liquid obtained separates into two layers; the one aqueous, with an acid reaction; the other, which is lighter, is a mixture of two oils, holding in solution a kind of tar, and offering some analogy to the products of distillation of coal.

On distilling this liquid three very distinct bodies are obtained, an oil lighter than water, an oil heavier than water, which two hold in solution a resinous body; lastly, some crystals, which appear to be naphthaline, or some analogous body. A resin of a reddish-black colour remains in the retort.

The light oil is distilled twice with water to free it from the second oil, and a third time over chloride of calcium to separate the white resinous body. Thus purified it is a carburetted hydrogen, to which we have given the name of dracyle; it is colourless, and has an æthereal odour. Its specific weight =  $0.877$  at  $72^{\circ}$  Fahr.; it boils at  $257^{\circ}$  to  $261^{\circ}$  Fahr.; it does not become solid at  $5^{\circ}$  Fahr.; it is insoluble in water, soluble in alcohol, in æther, and in the fatty and essential oils; it burns with a fuliginous flame and distils over without alteration. Its composition, as afforded by analysis, is  $C^{16}H^5$ ; the density of its vapour, obtained by experiment, which coincides with that found by calculation, is  $3.7$ , and represents 4 volumes of vapour.

Potassium is without action upon dracyle; it absorbs hydrochloric acid without the production of solid camphor; sulphuric acid dissolves it with the assistance of heat, and it may be distilled over potash without change. Submitted to a current of dry chlorine, dracyle absorbs a large quantity, with evolution of heat and disengagement of hydrochloric acid, and is converted into chloro-dracyle, the formula of which,  $C^{16}H^3Cl^2$ , indicates that 2 equivalents



of hydrogen of the dracyle have been replaced by 2 equivalents of chlorine.

*Action of fuming Nitric Acid on Dracyle.*

The action of fuming nitric acid on dracyle varies according to the proportions of acid employed and the temperature at which the reaction is effected. On causing from 6 to 8 parts of fuming nitric acid to act with the assistance of heat on 1 of dracyle a red solution is obtained, which concentrated to a certain degree solidifies on cooling into a kind of yellowish magma. This body treated with boiling water gives up to it an acid crystalline compound, while a kind of reddish oil separates and collects at the bottom. This oil, purified by distillation with water, has the odour of oil of bitter almonds; it is heavier than water, has a sweetish taste; it is insoluble in water, soluble in æther, alcohol and in potash; it burns with a fuliginous flame. Heated with potash it gives off ammonia and hydrogen. An alcoholic solution of this oil treated with a solution of potash solidifies into a crystalline paste. In these two latter reactions it resembles the hydruret of benzoyl, but it is decidedly distinct as it contains nitrogen.

We have called the acid body which dissolved in the boiling water nitro-dracylic acid; it is obtained pure by crystallizing it several times from water in small brilliant needles arranged in stellate groups; it is scarcely soluble in cold water, slightly soluble in boiling water, and very soluble in alcohol. Heated on platinum foil it leaves a scarcely-perceptible residue, and sublimes in minute needles.

The composition of this acid may be represented by  $C^{16}H^6O^4(NO^4)$ ; it behaves as a weak acid towards bases, and displaces carbonic acid. The salts with alkaline bases are all soluble, the others are insoluble, or but little soluble. The former are obtained direct, or by decomposing a carbonate; the others by double decomposition, or by boiling the acid with an oxide or carbonate.

Nitro-dracylic acid produces in protosalts of iron a white precipitate, which becomes red by boiling; it does not throw down persalts of iron. Nitro-dracylate of copper is a green powder, insoluble in water and in alcohol; it is obtained by treating acetate of copper with a solution of nitro-dracylic acid. The lead salt is obtained by boiling an excess of carbonate of lead with nitro-dracylic acid; it crystallizes in beautiful radiated needles, which are perfectly white and pretty soluble. The silver salt is obtained in the same manner in the form of verrucous crystals, which are tolerably soluble.

The nitro-dracylates detonate when heated. The acid is thrown down from its saline solutions by strong acids.—*Comptes Rendus*, September 11.

*Classification of the volatile Organic Acids.*

M. Cahours divides these into three groups:—1st, acids with 4 atoms of oxygen, for instance formic, acetic, baldric and benzoic



acids; they are decomposed by the action of strong bases at a high temperature into carbonic acid and a volatile carburetted hydrogen; they are all monobasic, cannot exist in an anhydrous state, and form neutral æthers, in which 4 volumes are condensed into one: 2nd, acids with 6 atoms oxygen, for instance salicylic and anisic acids; they are monobasic, form acid æthers, and afford on distillation with an excess of alkali products which contain 2 volumes of oxygen, and in which 4 volumes are condensed into one: 3rd, acids with 8 atoms of oxygen, for instance succinic, suberic, and probably camphoric acids; they are all tribasic.—*Comptes Rendus*, p. 212.

*On the Gall.* By Professor LIEBIG.

[Continued from page 621.]

*Acid Choleate of Soda*; *Gall-substance*, according to Berzelius's former views; *Bilifellinic Acid* with an excess of *Biline*, according to his recent views.

When a solution of gall in absolute alcohol is freed by cautious addition of barytic water from the colouring substance, then filtered, and sulphuric acid, diluted with half its volume of water, added to the clear liquid to separate the excess of barytes and sulphate of soda; and if the free sulphuric acid be then removed with some carbonate of lead, the excess of lead by sulphuretted hydrogen, and the liquid evaporated, a slightly yellowish mass, having the taste of gall and void of smell, remains, which is freed from fat acids by treatment with æther. It absorbs moisture from the atmosphere, dissolves readily and in every proportion in water and in alcohol, but not in æther; the aqueous solution turns blue litmus-paper red (Berzelius); on calcination it leaves a strongly alkaline ash. If the alcoholic solution of pure gall is freed exactly according to Berzelius's directions, by means of sulphuric acid, from the bases which are precipitated by it, then saturated with carbonate of soda, evaporated to dryness, and treated with alcohol, this dissolves a soda compound, which is identical in its properties with pure gall; its solution is not rendered turbid by acetic acid and excess of hydrochloric acid; it affords 11.5 per cent. ash, which contain 11.13 carbonate of soda and 0.37 chloride of sodium. The analysis furnished—

	Kemp.	
Carbon . . . . .	58.80	60.38
Hydrogen . . . . .	8.51	8.74
Nitrogen . . . . .	3.40	3.74
Oxygen . . . . .	29.29	27.14
Soda . . . . .		
Common salt . . . . .		

These numbers show that pure gall undergoes no other change by treatment with hydrochloric acid than that a portion of the base is removed. Recombined with soda, the original composition is restored.

When the aqueous solution of the bicholeate of soda, prepared



according to Berzelius, is treated with oxide of lead, it cakes together in the manner of a plaster, while some choleate of lead and neutral choleate of soda, *i. e.* bile with all its properties, remain in solution. This is evident from basic acetate of lead throwing down entirely all the bitter substance (Enderlin). Berzelius, who was not acquainted with the property of pure gall being precipitated from its aqueous solution by basic acetate of lead, regarded the body remaining in the solution as a peculiar substance, to which he gave the name of *Biline*; but this biline possesses no property which distinguishes it from pure gall.

Several products of decomposition are formed by the action of mineral acids on choleic acid, for instance *choloidic acid*, *taurine* and ammonia, of which the two former have been submitted to analysis by Demarçay. Choleic acid is decomposed by the action of potash into ammonia, carbonic acid and *cholic acid*.

The composition of choloidic acid and of the cholinic acid\* is, according to analysis—

	Choloidic Acid.				Cholinic Acid.
	Dumas.				Dumas.
Carbon . . .	73.522	73.301	73.156	73.3	68.5
Hydrogen ..	9.577	9.511	9.477	9.7	9.7
Oxygen ....	26.901	27.188	27.367	27.0	21.8

If we attempt to explain these metamorphoses from the analyses of gall and of choleic acid, as well as from the products which result from their decomposition by acids and alkalies, we obtain, as the nearest expression of the composition of the hydrated choleic acid, the formula. . . . .  $C^{76} H^{66} N^2 O^{22}$ , and deducting from this formula the elements of taurine . . . . .  $C^4 H^7 N O^{10}$  }  $C^4 H^{10} N^2 O^{10}$ , and ammonia . . . . .  $H^3 N$  } we obtain for choloidic acid the formula . . . . .  $C^{72} H^{56} O^{12}$ .

If we take the elements of 2 atoms of carbonic acid and 2 equivalents of ammonia from the elements of choleic acid, there remains a formula which agrees very closely with the composition of cholinic acid. Calculated according to this supposition, the theoretical composition of these bodies would be as follows:—

	Choleic Acid. $C^{76} H^{66} N^2 O^{22}$ .	Choloidic Acid $C^{72} H^{56} O^{12}$ .	Cholinic Acid. $C^{74} H^{60} O^{18}$ .
Carbon . . . . .	63.24	74.4	68.9
Hydrogen . . . . .	8.97	9.4	9.2
Nitrogen . . . . .	3.80	0.0	0.0
Oxygen . . . . .	23.95	26.2	21.9

If we represent the formula of the choleic acid by Ch, and assume that twice the number of the elements of the choleic acid is combined in the gall itself with 3 atoms of soda, it should contain 6.66

\* The substance here termed cholinic acid was called cholic acid by Demarçay, a name which must be retained for the acid discovered by L. Gmelin.



per cent. soda in 100 parts; Kemp obtained 6.53, a coincidence which could scarcely be greater in experiments of this kind.

When, according to Berzelius, the action of the acid in the metamorphosis of pure gall by hydrochloric acid is imperfect, or is carried beyond the point when choloidic acid is deposited, several intermediate products are formed, which are very imperfectly known. If, for instance, the substance (choloidic acid) prepared by boiling pure gall with hydrochloric acid is treated with alcohol of 0.84 spec. grav., sometimes the whole is not dissolved, but there remains a resinous body, which dissolves with difficulty in boiling alcohol, and from which it is deposited in the form of a white earthy powder. Berzelius has given the name of *Dyslysine* to this body.

When the alcoholic solution (of the choloidic acid) is saturated with ammonia and evaporated, a resinous body separates, and still more is obtained if the liquid be evaporated to dryness and then treated with water. The aqueous solution affords with muriatic acid a white precipitate in flakes, which gradually collect and cake together to a solid mass, which is hard and friable. This substance melts above 212° Fahr. to a clear mass, which on cooling is hard and transparent, resembling colophony; boiled in water it becomes soft like pitch, and produces a turbid, slightly bitter solution, which has an acid reaction. This body is easily soluble in alcohol, and likewise in alkalies; its combinations with the alkalies are precipitated entirely from its aqueous solution by caustic or carbonate alkalies; they are soluble in alcohol; with salts of barytes they produce a white plaster-like precipitate. Berzelius has named this body *Fellinic Acid*; it appears to be nothing else than a combination or mixture of the following substance with unaltered choleic acid.

The above-mentioned resinous mass, which is left undissolved by the water from the residue obtained by evaporating the ammoniacal solution of the choloidic acid, treated with hydrochloric acid at the ordinary temperature, falls into light white flakes, which become soft and tenacious in hot water. A solution of this substance in alcohol forms, on the addition of caustic potash, a combination which is soluble in water and in alcohol, and precipitates salts of barytes. The principal distinction between this substance, which Berzelius calls *Cholinic Acid*, and the preceding, is, that it swells in carbonate alkalies, without however dissolving in them or subsequently in water.

Purified gall affords with barytic water, or with chloride of barium and ammonia, no precipitate;—a proof that neither of the two bodies just described exist in it already formed.

*Cholic Acid* of L. Gmelin.—If the precipitate which is obtained by adding subacetate of lead to the aqueous solution of the alcoholic extract of the gall be suspended in water and distilled vinegar, then decomposed by sulphuretted hydrogen and the liquid evaporated, small needles of cholic acid are obtained, which are obtained pure by repeated crystallization. More acid may be obtained from the separated sulphuret of lead by exhausting it with boiling alcohol,



adding water to the solution, removing the resinous body which separates, and evaporating to crystallization.

In its pure state cholic acid forms minute white needles, which adhere together on being pressed between paper, forming laminæ which have a slight silky lustre; its taste is extremely sweet and somewhat acrid; the crystals dissolve readily in alcohol, with great difficulty in cold water, more easily in hot; the solutions redden litmus paper. The crystals melt at a higher temperature, and afford on dry distillation a thick brown oil and a strongly ammoniacal fluid; they burn in the air, giving off a strong smell of horn. It is not decomposed by nitric acid or concentrated sulphuric acid when heated; it dissolves in cold oil of vitriol without imparting any colour to it, and is thrown down again by water; it forms a crystalline salt with soda.

According to L. Gmelin, cholic acid is not precipitated by the neutral acetate of lead, but it is rendered turbid by the subacetate; cholate of ammonia, according to Fromherz and Gugert, does not precipitate the salts of lead; it is therefore probable that the cholic acid is not contained as such in the gall, but is a product of the decomposition of the choleic acid; it differs essentially from Demarçay's cholinic acid by containing nitrogen.

Berzelius added carbonate of potash to a solution of the alcoholic extract of the gall in water, and let it boil for some hours, then evaporated until the (altered) gall again separated on the surface from the concentration of the liquid; he then poured off the colourless alkaline liquid, dissolved that which had separated in water, and precipitated with acetic acid, when a white deposit formed, which consisted of a shining mass or tissue of minute crystals, possessing all the properties of Gmelin's cholic acid.

*Cholanic Acid*.—Gall which is become putrid and semi-fluid from long keeping, freed by æther from all substances soluble in that medium, then dissolved in alcohol and decolorized with barytic water, afforded, after removing the alcohol, a pale yellow residue, which dissolved in water. Acetic acid produced in this solution a plaster-like precipitate, which dissolved readily in caustic ammonia.

The ammoniacal solution, diluted with 100 parts water, deposits after long boiling a white precipitate. When this precipitate is dissolved in ammonia and chloride of barium added to the solution, a white insoluble salt of barytes is thrown down, which boiled with carbonate of soda affords carbonate of barytes and a soluble salt of soda. On adding hydrochloric acid to a solution of this soda salt, a white flocculent body, which however does not cake together, is obtained: it possesses the principal properties of the choloidic acid described by Demarçay. Berzelius calls this substance *Cholanic Acid*\*.

*Fellanic Acid*.—The solution of the ammonia salt which deposited the white precipitate on boiling, affords with hydrochloric acid

\* This substance is entirely distinct in its behaviour from Demarçay's cholic acid, which was described at p. 648 as cholinic acid.



a plaster-like precipitate, which treated with æther and water leaves behind a white powder possessing acid properties. Berzelius has termed this substance *Fellanic Acid*. The most characteristic property of this acid is that it forms a salt with barytes, which dissolves with difficulty in cold, readily in hot water, from which, as well as from hot alcohol, it separates on cooling in transparent colourless prisms. *Bilinic acid, fellinic acid, cholinic acid, fellanic acid, cholaninic acid*, do not refer to peculiar, well-characterized bodies, but have only been employed to represent certain changes which the organic substance of the gall has undergone by decomposition.

The yellowish-green or dirty green substance to which the gall owes its colour may be removed by simple treatment with animal charcoal, as above mentioned, which proves that it does not belong to the composition of the soda combination.

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The most important result of some new experiments which I have detailed above is, that the gall is entirely thrown down by basic acetate of lead, that therefore no neutral substance, *no biline*, remains in the solution. The plaster-like precipitate which is formed under these circumstances is not entirely insoluble in water; its solubility is increased by the acetate of soda which remains in the solution. If, for instance, we filter the precipitate produced by subacetate of lead in gall, throw down the excess of lead by sulphuretted hydrogen, and evaporate to dryness, there remains acetate of soda, which contains a small quantity of sulphuric acid. If we now add some pure gall to a solution of this residue, the liquid is not thrown down by subacetate of lead, although the gall without the acetate of soda is easily and entirely precipitated. When choleic acid, freed entirely from bases, is digested in its aqueous solution with oxide of lead, only a small quantity of a lead salt, but no biline, remains in the liquid.—*Ann. der Chem. und Pharm.* for July.

### *Observations on the Bile.*

TO THE EDITOR OF THE CHEMICAL GAZETTE.

SIR,

In your Journal for the 1st of October I observe a translation of a paper on the Bile by Professor Liebig. For all the important leading *facts* of that paper the Professor is indebted to me; but this is not all. He has so modified my results as to make them support an error, which they are calculated entirely to overthrow. The electro-negative body in the bile is neither *isomeric* nor identical with the choleic acid of Demarçay, as I have proved in the Journal of Erdmann and Marchand, as well as in the 'London Medical Gazette.'

Subsequent researches, on a very extensive scale, with reference to the biliary secretion in omnivorous and carnivorous as well as graminivorous animals, fully confirm the results which I obtained at Giessen; and I shall, with as little delay as possible, call Pro-



fessor Liebig to a severe account for the modifications which he has so subtly made in my analyses.

Will you do me the favour of inserting this note in your next Number, to prevent my name being attached to what I conscientiously believe *untrue*?

I remain, Sir,

Your obedient Servant,

GEO. KEMP, M.D., Cantab.,

Professor of Inorganic Chemistry  
at Queen's College, Birmingham.

Birmingham, Oct. 7, 1843.

## ANALYTICAL CHEMISTRY.

*On the Blowpipe.* By THEO. F. MOSS, *Mining Engineer.*

[Continued from p. 547.]

AFTER examining a substance in a glass tube, and in a tube closed at one end, another portion of the substance must be heated, held in platina pincetts, before the flame of the blowpipe, to see if it is fusible, and to what degree; and for this purpose a scale recommended by Kobell may be used with advantage. This scale is,—1st, gray antimony ore, which melts in a common flame; 2nd, natrolite, which melts in fine splinters in the inner flame, and in large pieces easily before the flame of the blowpipe; 3rd, adular does not melt in the flame of the lamp, but easily before the blowpipe flame; 4th, almandine melts with difficulty before the blowpipe flame; 5th, augite melts with more difficulty than almandine, but easier than 6th, bronzite, which can only be fused before the blowpipe on the edges of the finest splinters. It is advisable to have splinters of these minerals at hand for the sake of comparison, and the difference of fusibility of any mineral between any numbers of the scale is computed in decimal places, in the same manner as in determining the hardness. The relative fusibility of minerals is of great use in determining the silicates from one another, which generally have the same chemical reactions before the blowpipe, but have different degrees of fusibility. Care must be taken to use fine splinters of the mineral, as by using thick pieces a mineral often seems infusible when in reality it can be fused with ease; and with little practice the degree of fusibility of any mineral, as compared with the scale, can easily be determined.

Minerals heated in the platina pincetts often colour the flame, in which case, in order to determine correctly the colour, a pure blue flame must be blown, and the mineral held at the edge of the flame; in this manner the presence of some substances may be determined with great certainty. An intense violet flame is produced by potash; but if the same mineral contains soda or lithia, the flame will be coloured either yellow from the soda or red from the lithia. A green flame is produced by sulphate of barytes, the ores of tellurium, and



some of the ores of copper. Many of the compounds of sulphur, arsenic and antimony, cause a pale, bluish-green flame. A beautiful blue is produced by the muriate of copper, muriate of lead and seleniuret of lead.

After having heated a substance in the pincetts, it is laid on curcuma paper, and wetted with a drop of water, and if the paper is coloured brown or brownish-red it shows an alkaline reaction; this alkaline reaction is exhibited by all the combinations of the alkalies and alkaline earths with carbonic acid, sulphuric acid, nitric acid, muriatic and fluoric acids, and with water.

After having thus examined the substance, the mineral is to be examined on charcoal; if the substance is in powder, it must be made into a thick paste, and put on the coal. Most of the metals melt into the coal before the blowpipe flame, and are oxidized, except gold and silver; platina, iridium, palladium, rhodium and osmium, are infusible.

Molybdenum, tungsten, nickel and iron, are also infusible; their oxides can however be reduced by the inner flame. Most of the sulphates are fusible on coal, and are for the greater part changed to the oxides with disengagement of sulphurous gas. Most of the metallic oxides are infusible before the blowpipe, but are generally more highly oxidized by the outer, or deoxidized by the inner flame. The following few oxides are fusible:—the oxides of lead, bismuth, antimony and copper.

Salts soluble in water melt before the blowpipe flame on coal, but are mostly decomposed, and leave their base on the coal. The alkaline salts are either drawn into the coal or melt into a bead; most of the insoluble salts melt into a bead, which on cooling becomes crystalline.

Some substances on being heated on charcoal undergo a change of colour, by which they may be easily recognized; zinc oxide is white when cold, but becomes yellow when heated; and the original colour of many substances when heated becomes much darker. A very important means of knowing minerals is their sublimate, that is, the volatile oxide which is deposited on the coal around the mineral when heated in the oxidizing flame. A white sublimate is formed by tin, zinc, antimony, arsenic and tellurium; the sublimate of tin is thick, and can be reduced by the inner flame; the zinc sublimate is when warm yellow, but on cooling white, and burns with a white phosphorescent flame; if cadmium is present the zinc sublimate is surrounded by a dark yellow sublimate of cadmium oxide; the sublimate of antimony is also thick, and volatilizes where it is touched by the blowpipe flame; the sublimate of arsenic is white, in thin layers grayish, and far from the mineral, and can be volatilized by slightly heating; the sublimate of tellurium is white, but has a red or dark yellow edge, and vanishes on being blown on by the reducing flame, with a green appearance.

The sublimes of lead, bismuth and cadmium, are very similar; the sublimate of bismuth is when warm dark orange-yellow, when cold lemon-yellow, and in thin layers bluish, and can be driven



from one place to another by the blowpipe flame, when it is partly volatilized; the sublimate of lead is when warm dark lemon-yellow, when cold, sulphur-yellow, and in other respects like the sublimate of bismuth; the sublimate of cadmium is to be seen plainly only when it is cold; its colour is yellowish-brown, and in thin layers yellow, and can be volatilized by any flame.

Silver melted on coal in the oxidizing flame gives a slight dark red sublimate; when lead is present, the coal is at first covered with the sublimate of lead, and afterwards with the sublimate of silver.

After having examined the mineral before the blowpipe without reagents, and no satisfactory results obtained, it must be examined with reagents, which must be chemically pure, otherwise false results will be obtained.

The reagents which are used are—

Soda, which must in particular be free from sulphuric acid; borax, which must fuse into a transparent colourless glass; phosphate of soda, which must also fuse into a colourless glass; saltpetre, boracic acid, powdered fluor spar, a solution of nitrate of cobalt, which must not be very concentrated, and must be free from alkaline substances; tin, iron in the form of fine wire, lead, oxide of copper, litmus and turmeric paper.

The object of acting on the mineral with borax or phosphate of soda is to ascertain its solubility, and the colour which the discoloured substances give to a bead of borax or phosphate of soda in the oxidizing or reducing flame. This reaction is of great importance for metallic compounds.

Most of the combinations of manganese give, when melted with borax or phosphate of soda, a glass which in the oxidizing flame is violet-red, but in the reducing flame becomes colourless.

All minerals containing cobalt give these fluxes a sapphire-blue colour; chromium gives an emerald-green glass with these fluxes.

The oxide of iron, and most of the minerals containing iron, give these fluxes in the oxidizing flame a dark red colour, which on cooling becomes paler, then yellow, and when quite cold is colourless; in the reducing flame the glass is bottle-green, and remains so when cold.

The oxide of cerium gives in the oxidizing flame with borax a red or dark yellow glass, which on cooling becomes paler; in the reducing flame the glass is colourless.

The oxide of nickel gives with borax in the oxidizing flame when warm a violet-brown glass, which on cooling is red-brown; in the reducing flame the colour disappears, and the glass becomes grayish from small particles of reduced nickel; with phosphate of soda the reaction is the same in the oxidizing and reducing flame as with borax in the oxidizing flame.

The oxide of copper gives with borax and phosphate of soda in the oxidizing flame a light bluish-green glass; in the reducing flame a brownish-red, generally cloudy and opaque.

The oxide of uranium gives with borax in the oxidizing flame a dark yellow glass, which in the reducing flame is a dirty green; with



phosphate of soda in the oxidizing flame the glass is clear yellow, in the reducing flame a beautiful green, which becomes more apparent on cooling.

Molybdic acid gives with borax in the oxidizing flame a colourless glass, which becomes brown in the reducing flame; with phosphate of soda in the oxidizing flame the glass is green, but on cooling becomes paler; in the reducing flame it is dark, but on cooling becomes a beautiful green.

Tungstenic acid gives with borax in the oxidizing flame a colourless glass, which in the reducing flame is yellow; by a greater addition of tungsten it becomes after cooling blood-red. With phosphate of soda in the oxidizing flame the reaction is the same as with borax; but in the reducing flame the glass bead becomes of a beautiful blue colour when the acid is free from iron, but when iron is present the glass is blood-red.

Titanic acid with borax gives with the oxidizing flame a colourless glass, which in the reducing flame becomes a dirty amethyst colour; with phosphate of soda, with the addition of a little tin, in the reducing flame the bead is of a blue violet colour, but when iron is present the colour is red.

The other metallic oxides colour the glass beads of borax and phosphate of soda either not at all or yellow; the earths also do not colour the fluxes, but are all soluble in them except silica, which is not soluble in phosphate of soda.

In order to prove the presence of fluorine in a mineral, a small quantity of it is melted with phosphate of soda in the end of a glass tube, when hydro-fluoric acid is formed, which destroys the glass.

To prove the presence of chlorine in a mineral, take a bead of phosphate of soda charged with oxide of copper, so that the bead is strongly coloured with the copper; then add the mineral, and if it contains chlorine the flame will be of a beautiful blue. Bromine and iodine have the same reaction, but bromine colours the flame bluish-green and iodine pure green.

From the above it will be seen that no two oxides have the same reaction with borax and phosphate of soda in both the oxidizing and reducing flame; therefore it is necessary in all cases to examine the mineral with both fluxes.

#### *On the Reaction with Soda.*

When a substance is treated with soda, the two are generally melted together on coal, the substance is either applied in splinters or in powder, and the soda gradually added. A great many substances have the property of uniting with soda at a high temperature, and combinations are formed, of which some are fusible and some infusible. However, but few belong to the fusible, viz. silica, and a few metallic oxides, viz. the tungstenic, titanic and molybdic, which, with the exception of the combinations of silica, are mostly drawn into the coal.

In order to try the fusibility of a substance with soda, if the substance is in the form of a powder, a paste is made with it and some



soda; but if it is in splinters it is covered with a paste of soda, and laid in a small hole in the charcoal, and at first slightly heated to drive off the water, and then strongly heated with the oxidizing flame. At first, when the soda begins to fuse, it is drawn into the coal, but makes its appearance again when it begins to unite with the substance, it then fuses with effervescence into a bead; if the substance is insoluble in soda, but decomposed by it, it changes its appearance, and does not fuse into a bead.

If a substance is soluble in soda, and not enough soda has been added, a part of the substance remains undissolved, and is surrounded by a clear glass; but if too much soda has been added, the glass on cooling becomes opaque; therefore it is advisable always to add the soda in small proportions, in order to see the changes which are produced by the addition of greater quantities.

A substance which is soluble in soda, if it contain sulphur or sulphuric acid, gives the glass a yellow-red or yellow-brown colour, according to the greater or less proportion of sulphur in the substance.

If a substance soluble in soda is, in the form of powder, melted with soda on platina foil, and the fused mass has a bluish-green colour, it shows the presence of manganese.

If the mineral contains silica and the oxide of cobalt, the silicate of soda is formed, which will be coloured blue by the oxide of cobalt.

By the reduction of metallic oxides by the aid of soda, the presence of metals in minerals, if contained in small quantities, can be detected with more accuracy than by analysis in the moist way.

If a metallic oxide is in combination with substances which render its reduction difficult and the reduced metal difficult of determination, the mineral must be reduced to a fine powder and mixed with soda to a paste, and melted on coal before the reducing flame. The first portion of the soda is generally drawn quickly into the coal, therefore it must be continually re-added till no more of the assay remains on the surface of the coal. The first part of the soda serves to collect the metallic contents, and the latter to reduce the metallic oxides. After the reduction of the mineral, the part of the coal where the reduction took place must be moistened with a few drops of water, and all that part of the coal which is saturated with soda cut out with a knife, and rubbed in an agate mortar with water to a fine powder, and slowly triturated, that the coal and unreduced substances may separate easily from the more heavy metallic particles, and be easily drawn off with water from these. This must be continued till all but the metallic parts are removed from the mortar. If the mineral does not contain a reducible metal, the mortar will be empty; but if it contains only a small quantity of such a metal, there remains at the bottom of the mortar shining flat spangles of the metal if the metal was easily fusible and malleable, but a metallic powder if the metal was hard to be fused or not very malleable.

In this manner we may very readily detect one-half per cent. of



tin, and a still less proportion of copper, in a mineral: if several metallic oxides are contained in the same mineral, they are generally reduced together to an alloy; sometimes separate reguli of each mineral are obtained.

The metals which in this manner may be reduced are molybdenum, antimony, tungsten, tellurium, copper, bismuth, tin, lead, zinc, nickel, cobalt, iron, silver and gold. Among these are some which are either totally or in part volatilized, and cover the coal with their oxides; to these belong antimony, tellurium, bismuth, lead and zinc. Arsenic, cadmium and quicksilver are also reduced with soda, but are again immediately volatilized, and can only be obtained in a metallic form by sublimation with soda in glass tubes.

If, in reducing with soda, a metallic regulus is obtained, which is an alloy of several metals, it must be handled with borax or phosphate of soda, in the manner already described.—*Journ. of the Franklin Institute.*

## PHARMACOLOGY.

### Radix Sumbulus, or *Moschus Root.*

THIS root occurs in large discs of about  $4\frac{3}{4}$ " in length,  $2\frac{1}{4}$ " in breadth, and  $\frac{5}{4}$  to  $\frac{3}{4}$ " in thickness, of an ovate form; on the surface of section a white spongy and a yellow denser substance, are perceptible; the bark is of a light brown colour and very thin. The root has a strong odour of musk, and at the same time somewhat resembles that of camphor. The country whence it is derived is unknown, but it is supposed to come from Chinese Tartary.

Dr. H. Reinsch found in 1000 parts of the root—

Water .....	0.130
Essential oil .....	traces.
Balsam } extracted with æther .....	{ 0.126
Wax.. }	{ 0.002
Balsam.....	{ 0.002
Aromatic resin .....	{ extracted with alcohol of 0.003
A bitter substance soluble in water and alcohol .....	{ 0.819 spec. grav. .... { 0.010
A bitter substance soluble in water with gelatine and vegetable salts. }	{ extracted with alcohol of 0.064
A yellow bitter colouring substance soluble in alcohol .... }	{ of 0.933 spec. grav.. { 0.040
A gum soluble in cold water }	{ 0.082
Starch and salts.....	{ extracted with water ..... { 0.284
Gelatinous sediment.....	{ 0.072
Fibre .....	0.076
Starch .....	0.100
	<hr/> 0.991



The balsam appears to possess in particular the odour of musk, which is rendered very distinct on its being moistened with water.—*Jahrb. für Prakt. Pharm.*, vi. p. 297.

### *Fraudulent Opium.*

Dr. Winckler received this opium in fragments of about  $\frac{1}{2}$  lb. weight, consisting of a very friable mass. In external appearance it bore close resemblance to Bengal catechu, and on closer examination exhibited great similarity to Constantinople opium; its smell resembled that of the fresh extract of Belladonna, and it was coated with a slight yellow mould. The fracture was different from the Constantinople opium, being blackish-brown, with very numerous interspersed small shining white points.

It contained no morphine, but narcotine was mechanically intermixed with it.

On submitting it to the usual tests, it was found to exhibit great resemblance to the best kind of German opiums, but differed from them in its behaviour with solution of ammonia and perchloride of iron. The opium in question, exhibited a very considerable dark colouring when solution of ammonia was added to its aqueous solution, without producing however any opacity or precipitate, while Smyrna opium immediately affords a dirty white turbidness; and a precipitate of the same colour.

The solution of the false opium gave with perchloride of iron a dark brown colouring, but no opakeness; that of the Smyrna opium an intense dark brownish-red colouring, without any turbidness or precipitate.

Dr. Winckler inclines to believe that the residue of opium mixed with narcotine, after the morphine has been extracted, is fraudulently introduced into commerce as opium.—*Jahrb. für Prakt. Pharm.*, vi. p. 311.

### *Adulteration of the Moschus tunquinensis.*

M. Pfeffer of St. Petersburg found in a drachm of *Moschus tunquinensis* 11 grs. of native cinnabar, which had been mixed with it.—Gauger's *Repert.*, 1843.

### *On the Nature of the Moschus tunquinensis.*

Dr. Göbel, in his work on Pharmacy, states as his conviction, that the decidedly different properties of the Chinese (Tonquin) musk from the Russian (Kabardine) are produced in China by a peculiar treatment of the musk pod, which is as yet unknown, and that the Chinese musk is a natural product which has been partially altered by art.



## CHEMICAL PREPARATIONS.

*On the Preparation of Chromic Acid.* By Prof. A. SCHRÖTTER.

M. FRITZSCHE has shown that chromic acid may be obtained by adding gradually a sufficient quantity of concentrated sulphuric acid to a warm concentrated solution of bichromate of potash. The acid so prepared, dried on porous tiles, is however, as stated by M. Fritzsche himself, still contaminated with 8.62 per cent. mechanically-adherent sulphuric acid (?) and some bisulphate of potash. Mr. Warington has somewhat modified this process; he conveys from 120 to 150 volumes of pure concentrated sulphuric acid into 100 volumes of a cold saturated solution of bichromate of potash, when the chromic acid separates as in Fritzsche's method. The chromic acid thus prepared is however, as I have convinced myself, very impure; on analysis it gave—

Chromic acid.....	92.128
Sulphuric acid.....	0.708
Potash.....	6.770
	<hr/>
	96.606

Since the potash is partly combined with the sulphuric acid and in part with the chromic acid, it would contain only about 80 per cent. of free acid.

Fritzsche has also obtained chromic acid by the decomposition of chromate of lead with sulphuric acid, and has shown that the carmine-red crystals, although contaminated with sulphuric acid, are certainly not a chemical combination of the two acids. If this needed further proof, it would be clearly evident from the above analysis of the acid, prepared according to Mr. Warington's method.

I have ascertained that a very pure acid may be obtained very profitably and in a simple manner by the decomposition of chromate of lead with sulphuric acid; and as chromic acid promises to be of the greatest use to the chemist from the ease with which it parts with its oxygen to other bodies, I will briefly describe the process.

When 2 parts of concentrated sulphuric acid are added to 1 of the dry chromate of lead, and the thin paste thus formed is left for about twelve hours to itself, the decomposition is complete; this results sooner if the mass be slightly warmed. If this paste be now treated with water, the sulphate of lead separates entirely in the form of a white powder, and may easily be separated from the red liquid, which is a mixture of chromic acid and sulphuric acid. Somewhat diluted, this liquid may be filtered without fear of any decomposition; but from the ease with which the sulphate of lead is deposited this is not necessary. The clear red solution is now evaporated, which is best effected in a retort, in order to prevent any dust from falling in. The liquid is kept boiling for some time, and is then allowed to cool, when the greater portion of the chromic acid separates in the most beautiful carmine-red crystals. On further evaporation and cooling more acid is obtained. As soon as the



liquid has attained a certain degree of concentration, a density of about 1.55, nearly the whole of the chromic acid separates. 100 parts of this greenish liquid gave only 4.5 per cent. oxide of chromium, which existed in it for the greater part as acid, since after long standing in a closed vessel most of it was deposited on the sides of the vessel in beautiful red crystals. Further experiments showed, that on employing a sulphuric acid free from compounds of chlorine, a very inconsiderable quantity of chromic acid is reduced to oxide.

The acid prepared in this manner, after being dried on tiles, contained no other impurity than 1.2 per cent. sulphuric acid; it is therefore purer than that prepared in any other manner. I have not succeeded hitherto in removing this small amount of sulphuric acid, although I have made many attempts both with chromate of lead and chromate of barytes. When the chromate of lead is made into a paste with water previous to its being treated with sulphuric acid, only a partial decomposition takes place, however much sulphuric acid may be added. With 1 atom of acid to 1 of the salt the action is very slight, even when the mixture is heated to boiling; but if 7 atoms of acid be added to 1 atom of salt, a heavy faint yellow powder immediately separates, which is probably only a mixture of sulphate and chromate of lead. It is however impossible to decompose this further, even by boiling with concentrated sulphuric acid; and its composition also appears to be constant, for I obtained in analyses from substance resulting from two different operations—

Sulphate of lead.....	92.44	92.60
Chromate of lead .....	7.56	7.40

since however this composition corresponds to a very unusual formula, it must be probably considered as a mixture only.

It is hence evident that it would not be advantageous to decompose the lead salt with dilute sulphuric acid, since more time would be needed, and there would also be a loss of 8 per cent. lead salt. It is however remarkable, that in both cases, with concentrated and with dilute sulphuric acid, the decomposition results with some rapidity only when a considerably larger quantity of acid has been added than is requisite to form sulphate of lead. If we consider attentively the behaviour of a liquid containing sulphuric acid, chromic acid and water on being boiled, it must be concluded that the sulphuric acid, when it contains a certain amount of water, is unable to hold any, or but very little chromic acid in solution. This behaviour is the more surprising, as a considerable amount of chromic acid may be dissolved in sulphuric acid, forming already at the ordinary temperature a beautiful dark red solution. It results therefore that chromic acid is only insoluble, or at least very slightly soluble, in sulphuric acid of a certain degree of concentration, but that it is soluble to a very considerable amount in a weaker and also in a stronger acid. Granting this, concentrated sulphuric acid in which chromic acid has been dissolved must on the addition of water deposit the greater portion of the acid, which on the addition of more water would be redissolved. This actually takes place; and it is in fact this property of the two acids in their aqueous solution which



renders the method described of preparing chromic acid possible; for were it to dissolve readier in more concentrated sulphuric acid, then none would separate on evaporation, since the temperature at which sulphuric acid would be expelled would also decompose the chromic acid.

Although it is quite certain that the carmine-red crystals of the chromic acid contain no chemically-combined sulphuric acid, yet it is very probable that such a compound exists; this is however not red, but yellowish-brown. If, for instance, some chromic acid be conveyed into some sulphuric acid perfectly free from lead, it dissolves in it at the ordinary temperature with a red colour; but if gradually more chromic acid be brought into this solution, it acquires a yellowish-brown colour, and after several hours a sediment of the same colour has formed, and the supernatant liquid now contains very little chromic acid. This yellowish-brown precipitate is not further soluble in concentrated sulphuric acid, but if it be heated with it to about  $482^{\circ}$  Fahr. it dissolves and separates again partially on cooling. A drop of water added to it immediately separates red chromic acid. The same brown substance is formed when anhydrous sulphuric acid is added to chromic acid. I have hitherto not succeeded in perfectly isolating this body; some analyses however, made under variously-modified conditions, have shown that it may most probably be represented by the formula  $\text{CrO}^3 + 3\text{SO}^3$ ; whence it would follow that the chromic acid behaves as a base towards the sulphuric acid.—Poggendorff's *Annalen*, No. 8, 1843.

*On the Preparation of Hyposulphite of Potash by means of Chromate of Potash. By M. DÖPING.*

The reduction of the bichromate of potash by sulphur in slight excess at a low red heat is, as is well known, a very useful and certain method of preparing oxide of chromium for purposes of the arts. In this operation a very complicated action occurs between the excess of the sulphur, the potash and the oxygen of the chromic acid, and according to circumstances there is formed sulphate of potash, hyposulphite of potash and sulphuret of potassium in various proportions; so that the process cannot in this manner be turned to account in the preparation of hyposulphite of potash. Very good results are however obtained when a solution of the sulphuret of potassium is added to a solution of 1 part neutral chromate of potash in 8 parts water, and this mixture then heated in a porcelain dish on the sand-bath until a sample filtered from the separated hydrate of the oxide of chromium affords, neither on being heated with the chromate of potash nor with the sulphuret of potassium, any further precipitate. We must however not be deceived by the separation on boiling of some oxide of chromium which had remained dissolved in the free potash of the liquid. The oxide of chromium is deposited as a gelatinous, very voluminous hydrate; after the reaction has terminated the mixture is boiled for a time, filtered through linen, the precipitate washed several times with water, the mother-leys



united and brought to crystallization. Some sulphate of potash generally separates from the yellow liquid, if the sulphuret of potassium contained any; on further concentration the hyposulphite of potash crystallizes at first in beautiful large rhombic octahedrons of a *yellow* colour; subsequently a fainter yellow-coloured salt separates in acicular six-sided columns. In other cases the prismatic salt separates rather than the octahedron; sometimes alternately in the one form, then in the other, which evidently depends on the degree of concentration and on the temperature.

Both salts behave similarly; they give the usual reactions of the hyposulphites, deliquesce in a moist atmosphere, lose their water of crystallization at a higher temperature and become white, so that the peculiar colour and form can only depend on the amount of water. The whole of the water is given off at  $212^{\circ}$  Fahr., but this is attained quicker, and without danger of decomposition, at  $302^{\circ}$  to  $358^{\circ}$  Fahr. The prismatic salt loses 8.31 to 8.77 per cent. water; the octahedral 13.08 to 13.24. The amount of potash of the prismatic salt, calculated from the residue remaining after ignition (neutral sulphate of potash), was 45.08 to 45.23 per cent., that of the octahedral 42.64 to 42.57. The formula  $\text{KO}, \text{S}^2\text{O}^2 + \text{aq}$  for the prismatic salt requires 45.22 potash, 8.62 water, 46.16 hyposulphurous acid; the formula  $\text{KO}, \text{S}^2\text{O}^2 + 1\frac{1}{2}\text{aq}$  for the octahedral salt, 43.35 potash, 12.4 water, and 44.25 hyposulphurous acid.

Since, according to the above method of preparation of the hyposulphite of potash, the whole of the chromium of the chromate of potash is again obtained as oxide of chromium, it will be found by no means more expensive than the plan hitherto followed.—*Ann. der Chem. und Pharm.*

### *Extract of Opium.*

M. Sitter of St. Petersburg has found that this extract is best prepared by triturating 1 part opium in a mortar with 4 parts cold water to a perfectly homogeneous mixture, straining, submitting the residue to a gradual pressure, and then treating it twice, first with half and then with a fourth of the original amount of water employed, straining and evaporating to dryness in the water-bath. In this manner he obtained above 62 per cent. extract.—*Nord Central Blatt.*

### *Quinine.*

According to M. Guastamacchia, embrocations with alcoholic solution of the sulphate of quinine along the vertebral column into the skin are most certain and effective in curing intermittent fever; for instance, *quinæ. sulph.* gr. viii., *Spirit. rectific.* ℥ss.—*Buchn. Repert.* xxiv. 3.

### *Remedy against Menorrhagia.*

According to Dr. Wittke, physician in Erfurt, the following preparation affords great service in menorrhagia:—



R<sub>x</sub> *Secal. cornut.* ʒjss—ʒjj., *affunde aq. fervid. q. s., ad colat.* ʒjv., *adde quincæ sulph. gr. x—xv., acid. muriat. gtt. xx., syrup. simpl.* ʒj. One table-spoonful four times daily, continued for a week after the bleeding ceases.—*Bericht des Naturh. Vereins in Thuringen*, 1843.

*Observations upon the Preparation of certain Ointments.* By M.  
DESCHAMPS.

The objects I had in view in undertaking the following experiments, were—1st, to ascertain whether the several varieties of fats might in all cases be used indiscriminately, or whether in certain preparations any particular fat be preferable; 2nd, whether certain ointments now kept as nostrums ought not to be made *officinal*; and 3rd, whether any means could be devised to prevent the changes which fats undergo, i. e. rancidity, *eremacausis*.

Having observed that the *Unguentum populeum* is subject to very little alteration by keeping, it struck me that its preservation might be attributable to the resinous matter which the fat extracts from the poplar buds, and further that a small quantity of benzoin dissolved in fat might equally prevent alteration, and afford an ointment with an agreeable odour. I prepared these fats in the following manner:—

R<sub>x</sub> Coarsely pulverized benzoin . . . . . 120·00 grammes.  
Freshly melted lard . . . . . 3000·00 ...

Heat for two or three hours in a water-bath, strain without expressing, and stir it now and then during cooling.

R<sub>x</sub> Buds of the poplar . . . . . 500 grammes.  
Newly melted lard . . . . . 3000 ...  
Water . . . . . 250 ...

Heat in a tinned vessel until it no longer contains any moisture, pass through linen, and stir now and then while cooling.

Having found that these ointments, which I have called benzoin and poplar ointments, presented after several years no change in the smell, I sought for tests capable of showing whether this preservation was real, and of indicating whether there was any difference between these fats and the ordinary fatty bodies. I found that iodide of potassium might be employed for detecting readily the rankness or acidity of fatty bodies; and I was led to conclude, from experiments useless to describe since the results are exhibited by the formulæ which I propose, that the fatty bodies the least alterable are those having poplar resin or benzoin dissolved in them; after which comes butter melted with care. The poplar ointment from matter which it removes from the buds, is coloured orange by alkaline substances, or those that act in a similar manner; but this change is confined to the colouring substance, since the subacetate of lead, after a very long time, does not affect its normal odour. The following ointments may be prepared according to the formulæ now given:—



*Iodide of Potassium Ointment.*

R <sub>x</sub> Iodide of potassium.....	4 grammes.
Water .....	4 ...
Ointment of benzoin .....	30 ...

This ointment may also be prepared with poplar ointment or with butter, as I found it to offer no change after six months.

*Pommade de Lyon.*

R <sub>x</sub> Red oxide of mercury .....	2 grammes.
Ointment of benzoin .....	32 ...
Volatile oil of roses.....	2 drops.

This pomade may be prepared with butter, but it does not keep so well as when prepared with benzoin ointment.

*Pommade de Régent.*

R <sub>x</sub> Acetate of lead .....	4 grammes.
Red oxide of mercury .....	4 ...
Camphor .....	$\frac{1}{2}$ ...
Benzinated fat.....	80 ...
Volatile oil of roses.....	8 drops.

This pomade can only be prepared with benzoin ointment. It is as beautiful one year after its preparation as if it had just been made.

*Pommade de Janin.*

Prepared according to the following formula this pomade does not become rancid one year after its preparation:—

R <sub>x</sub> Poplar ointment .....	20 grammes.
Prepared tutty .....	10 ...
Armenian bole .....	10 ...
Ammoniacal oxychloride of mercury....	5 ...
Volatile oil of roses.....	5 drops.

*Rose Ointment.*

To obtain a rose ointment which will keep well it suffices to add 60 grammes of poplar buds to each kilogramme of lard while preparing it.

*Double Mercurial Ointment.*

This ointment prepared with poplar ointment does not become rancid eleven months after its preparation.

*Lip Salve*

is generally prepared from wax, oil of almonds, and sometimes a small quantity of spermaceti.

The following preparation affords a good salve, which does not become rancid and does not produce a disagreeable impression upon



the lips, arising from the granulation of the salve, resulting from a sudden variation of temperature :—

R <sub>x</sub> Poplar ointment . . . . .	120 grammes.
Recently melted suet . . . . .	40 ...
Alkanet . . . . .	8 ...

Place the whole in a tin vessel, heat to a moderate temperature, strain through linen, and scent with

Volatile oil of roses . . . . . 8 drops.

Mix and cool as rapidly as possible by stirring.

From the facts exposed in this Memoir it results that the benzoin and poplar ointments are preferable to all others ;

That the benzoin ointment, on account of its whiteness, should be preferred when the ointments are required to be white, or when a body enters into their composition which might act as an alkali ;

That the poplar ointment resists oxidation better than all other fatty bodies.—*Journ. de Pharm.* for September.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On Glazes for Earthenware, &c. free from Lead.*

THE glaze discovered by Messrs. Hardtmuth of Vienna consists of borax, felspar and clay, or brick-earth. The borax is taken just as it occurs in commerce, stamped fine, and passed through a sieve. The felspar is employed in its crude state, without regard to its purity or whiteness ; it is merely washed in water, then heated red-hot in the strongest fire of an earthenware kiln, and stamped. The loam, or brick-earth, is sifted, and also heated to redness, so that it has acquired a reddish colour.

100 lbs. of the borax, 50 lbs. felspar, and 50 lbs. of the clay thus prepared, are mixed carefully in a proper vessel ; meantime several cases of fire-clay are made, and these coated inside and at the bottom half an inch thick with pulverized quartz or flint (which has been previously heated to redness, to render it more easily reduced to a powder, upon which it is mixed with water so as to form a thick paste), in order that the fused glass may not adhere, and may easily be removed. The filled cases are exposed to the strongest heat of the kiln, when the mass runs to a glass.

The glaze is diluted with water to 40° of Beaume's areometer.

Dr. Moldenhauer and M. Gärtler have made several experiments on this glaze, at the request of the Union for the Promotion of the Industrial Arts for Hesse. They found that the only objection that could be made to it was the high price, owing to the borax and to the necessary comminution of the glaze.

M. Bernagoud of Mayence has endeavoured to overcome this evil by employing a mixture in which the borax is dispensed with.



It consists of 100 parts silica (washed sand), 80 parts purified pot-ash, 10 parts nitre, and 20 parts caustic lime (which by moistening with water had crumbled to powder,—hydrate of lime). The constituents are well mixed and melted in a graphite crucible, or in a reverberatory furnace, until the mass flows to a clear glass; during the melting it must be frequently stirred, as in the commencement it puffs up considerably, owing to the disengagement of the carbonic acid. The fused mass is poured out on clean iron plates, and when cooled ground to a fine powder. The objects to be glazed are first slightly burnt, and then placed under water, and the powder sifted uniformly over them. They are now dried in the air, and the glaze burnt in the kiln in the usual way. This glaze resists acids nearly as well as glass; it may also be coloured by the addition of smalt, or other metallic oxides.—*Polyt. Cent. Blatt.*, 1843.

### *Cement for Porcelain and Glass.*

The best and most beautiful cement for fractured porcelain and glass is, according to M. Keller, the following:—

2 parts isinglass, cut into fine pieces, are left for twenty-four hours covered with 16 parts water, then boiled down to 8 parts, mixed with 8 parts alcohol, and strained through linen. This liquid is mixed while hot with a solution of 1 part mastic in 9 parts alcohol, and to the whole  $\frac{1}{2}$  part gum ammoniacum, finely pulverized, added gradually, and the liquid rendered perfectly homogeneous. This cement while hot is quite liquid, but on cooling becomes hard. In using it both cement and the fragments are made as warm as possible, both pieces allowed to dry, then again rubbed over with the cement, and pressed together. After five or six hours the cement is perfectly hard. It is not applicable to vessels of porous earthenware; the best cement in this case is a thick solution of shell-lac in spirits of wine.—*Polyt. Cent. Blatt.*, 1843, No. 12.

### *Cleansing of Casks from Mould.*

M. Huenerwadel recommends concentrated sulphuric acid as the best means for purifying casks from mould and mouldy smell. So much is poured into the vessel that the acid on rolling the cask is sufficient to moisten every part. After a quarter of an hour the vessel is washed out with water. Large vessels, which cannot be rolled, are rubbed over with the acid.—*Schweiz. Gewerbeblatt*, 1843.

### *Sepia Colour from Molasses.*

Dr. Winterfeld observed that when the residue resulting from the action of sulphuric acid on molasses for the purpose of obtaining sulphurous acid is welledulcorated, it afforded an exceedingly delicate sepia colour in great quantity, which when rubbed up with gum and brought into form was greatly approved of. A more delicate colour is obtained by heating sulphuric acid with alcohol.



As soon as sulphurous acid is disengaged the operation is discontinued, and the residue washed with water until it no longer possesses an acid reaction. In this manner a colour is obtained which leaves nothing to be desired.—Ricke's *Wochenblatt für Land und Hauswirthschaft*, 1843, No. 9.

*Shell-lac containing Arsenic.*

H. Buchner, in Darmstadt, mentions his having found sulphuret of arsenic in the residue remaining on the solution of commercial shell-lac in alcohol.—*Jahrb. für Prakt. Pharm.*, vi. 1843.

*Cheap Method of preparing Schweinfurth Green.* By Prof. JUCH of Schweinfurth.

50 lbs. of sulphate of copper and 10 lbs. lime are dissolved in 20 gallons of good vinegar, and a boiling-hot solution of 50 lbs. white arsenic conveyed as quickly as possible into the solution; it is stirred several times, and then allowed to subside. The supernatant liquor is employed the next time for dissolving the arsenic.

The colour is collected on the filter, dried, pounded, sifted, and again rubbed up with a little muriatic acid.—*Mittheilungen des Böhm. Gewerbevereins*.

## REVIEWS.

*Familiar Letters on Chemistry, and its Relations to Commerce, Physiology and Agriculture.* By JUSTUS LIEBIG, M.D., Ph.D., F.R.S., Professor of Chemistry in the University of Giessen. Edited by JOHN GARDNER, M.D., Member of the Chemical Society.

THIS publication presents the eminent chemist of Giessen to the public under a novel aspect, namely as a popular expositor of the truths of the science he has studied so profoundly and advanced so greatly by his labours. As might have been anticipated, the views he has thus given us of chemical truth are highly graphic and lucid, eminently calculated to excite attention and interest. It is not often that men of genius,—themselves discoverers in science,—condescend to write familiar and untechnical expositions, a task usually consigned to humbler, and it must be admitted, too often unqualified hands; but it cannot be doubted that were the higher order of men of science to devote themselves to this service, it would be attended with many important results upon the cultivation of science and their own reputation. There is not, we think, a book in our language so calculated to excite the minds of youth and to give them a permanent impulse towards chemistry as the one before us, whilst it details no pretty experiments and affords no amusement apart from sound and solid knowledge. There is a spirit in it which excites one's enthu-



siasm, and we never felt so powerfully the satisfaction of being ourselves devotees of the science so beautifully described, as while perusing these Letters. To the author, this work, which probably cost him but little effort, must bring a great access of reputation; and to whom is not a well-deserved reputation an object of ambition? That the public will discover its merits, and that it will find its way into the drawing-room as well as the library, and be equally prized by the advanced man of science and the student, we venture to say is certain; and it must increase the respect entertained for chemistry wherever it is read. The influence of popular opinion upon the progress of a science is greater than would be willingly acknowledged. Every attempt to conciliate that opinion, when honourably and legitimately made, is therefore calculated to give the science an impulse, and to add to the number of its votaries; and it is only the most short-sighted and narrow-minded who would wish to see the followers of a science restricted. Such works as the present moreover are the most likely means which a man of genius can employ to make his reputation enduring. The scientific works of discoverers in chemistry, as in other sciences, are thrown into shadow, and are indeed often wholly buried in oblivion, as the science itself progresses, the author and his works occupying a paragraph, a page, or at most a more or less extended chapter in its history; whilst a work addressed to a wider circle, in a universal language, with the impress of genius, enjoys a perennial existence, edition after edition is issued, and this renders the fame acquired amongst contemporaries enduring to posterity. Who is there who now reads Davy's scientific works? and who is not familiar with his 'Consolations in Travel?'

This work of Liebig's has other claims upon our attention than its popular character. The immediate design of its publication, as he tells us in the preface, was to excite "the attention of government and an enlightened public to the necessity of establishing schools of chemistry, and of promoting by every means the study of a science so intimately connected with the arts, pursuits and social well-being of modern civilized nations." As a specimen of the happy manner the author has of expressing his views, and to illustrate their propriety for the purposes he avows, we may quote his account of the late improvements in the manufacture of soda and sulphuric acid:—

"The manufacture of soda from common culinary salt may be regarded as the foundation of all our modern improvements in the domestic arts; and we may take it as affording an excellent illustration of the dependence of the various branches of human industry and commerce upon each other, and their relation to chemistry. Soda has been used from time immemorial in the manufacture of soap and glass, two chemical productions which employ and keep in circulation an immense amount of capital.

"France formerly imported soda from Spain, Spanish soda being of the best quality, at an annual expenditure of twenty to thirty millions of francs. During the war with England, the price of soda,



and consequently of soap and glass, rose continually; and all manufactures suffered in consequence.

“The present method of making soda from common salt was discovered by Le Blanc at the end of the last century. It was a rich boon for France, and became of the highest importance during the wars of Napoleon. It was not long however in reaching England.

“In order to prepare the soda of commerce (which is the carbonate) from common salt, it is first converted into Glauber’s salt (sulphate of soda). For this purpose 80 pounds weight of concentrated sulphuric acid (oil of vitriol) are required to 100 pounds of common salt. The duty upon salt checked for a short time the full advantage of this discovery; but when the government repealed the duty, and its price was reduced to its minimum, the cost of soda depended upon that of sulphuric acid. The demand for sulphuric acid now increased to an immense extent; and, to supply it, capital was embarked abundantly, as it afforded an excellent remuneration.

“Sulphuric acid is now manufactured in leaden chambers, of such magnitude that they would contain the whole of an ordinary-sized house. As regards the process and the apparatus, this manufacture has reached its acmé; scarcely is either susceptible of improvement. The leaden plates of which the chambers are constructed requiring to be joined together with lead (since tin or solder would be acted on by the acid), this process was until lately as expensive as the plates themselves; but now, by means of the oxy-hydrogen blowpipe, the plates are cemented together at their edges by mere fusion, without the intervention of any kind of solder.

“We may form an idea of the amount of sulphuric acid consumed, when we find 50,000 pounds weight are made by a small manufactory, and from 200,000 to 600,000 by a large one annually. This manufacture causes immense sums to flow annually into Sicily. It has introduced industry and wealth into the arid and desolate districts of Atacama. It has enabled us to obtain platina from its ores at a moderate and yet remunerating price; since the vats employed for concentrating this acid are constructed of this metal, and cost from £1000 to £2000 sterling. It leads to frequent improvements in the manufacture of glass, which continually becomes cheaper and more beautiful. It enables us to return our fields all their potash (a most valuable and important manure) in the form of ashes, by substituting soda in the manufacture of glass and soap.”

After commenting on the various uses to which sulphuric acid is applied in the arts, the author concludes this letter with the following interesting observations:—

“After these remarks you will perceive that it is no exaggeration to say, we may fairly judge of the commercial prosperity of a country from the amount of sulphuric acid it consumes. Reflecting upon the important influence which the price of sulphur exercises upon the cost of production of bleached and printed cotton stuffs, soap, glass, &c., and remembering that Great Britain supplies America, Spain, Portugal and the East with these, exchanging them for



raw cotton, silk, wine, raisins, indigo, &c., we can understand why the English government should have resolved to resort to war with Naples, in order to abolish the sulphur monopoly, which the latter power attempted recently to establish. Nothing could be more opposed to the true interests of Sicily than such a monopoly; indeed, had it been maintained for a few years, it is highly probable that sulphur, the source of her wealth, would have been rendered perfectly valueless to her. Science and industry form a power to which it is dangerous to present impediments. It was not difficult to perceive that the issue would be the entire cessation of the exportation of sulphur from Sicily. In the short period that the sulphur monopoly lasted, fifteen patents were taken out for methods to obtain back the sulphuric acid used in making soda. Admitting that these fifteen experiments were not perfectly successful, there can be no doubt it would ere long have been accomplished. But then in gypsum (sulphate of lime) and in heavy spar (sulphate of barytes) we possess mountains of sulphuric acid; in galena (sulphate of lead) and in iron pyrites we have no less abundance of sulphur. The problem is, how to separate the sulphuric acid or the sulphur from these native stores. Hundreds of thousands of pounds weight of sulphuric acid were prepared from iron pyrites, while the high price of sulphur consequent upon the monopoly lasted. We should probably ere long have triumphed over all difficulties, and have separated it from gypsum. The impulse has been given, the possibility of the process proved, and it may happen in a few years that the inconsiderate financial speculation of Naples may deprive her of that lucrative commerce. In like manner, Russia, by her prohibitory system, has lost much of her trade in tallow and potash. One country purchases only from absolute necessity from another, which excludes her own productions from her markets.

“Instead of the tallow and linseed oil of Russia, Great Britain now uses palm oil and cocoa-nut oil of other countries. Precisely analogous is the combination of workmen against their employers, which has led to the construction of many admirable machines for superseding manual labour. In commerce and industry every imprudence carries with it its own punishment; every oppression immediately and sensibly recoils upon the head of those from whom it emanates.”

In a similar manner he sketches out the applications of chemistry to physiology and agriculture, and especially his own recent and valuable investigations. That Liebig is too sanguine, somewhat misled by his enthusiastic love for chemistry, upon the influence to be expected upon medicine and agriculture, many persons may be allowed to think; and such persons reading these letters may find a few passages to object to, as being too positive assertions upon points at present debatable, and requiring much laborious investigation ere we may venture to speak upon them in the language of certainty. Such objections are constantly made to Liebig's other works. Liebig is, however, far from this assumption of infallibility; he readily admits the openness of all the great questions relating to



chemistry in its application to organic nature, physiology and agriculture. He says—

“*To the united efforts of the chemists of all countries we may confidently look for a solution of these great questions, and by the aid of enlightened agriculturists we shall arrive at a rational system of Gardening, Horticulture and Agriculture, applicable to every country and all kinds of soil, and which will be based upon the immutable foundation of observed facts and philosophical induction.*”

The intimate connexion of the various branches of human industry, the community of interests likely to result from the perfection of their scientific basis, is beautifully illustrated by the last Letter:—

“My recent researches into the constituent ingredients of our cultivated fields have led me to the conclusion that, of all the elements furnished to plants by the soil and ministering to their nourishment, the phosphate of lime, or rather the phosphates generally, must be regarded as the most important.

“An enormous quantity of these substances, indispensable to the nourishment of plants, is annually withdrawn from the soil and carried into great towns in the shape of flour, cattle, &c. It is certain that this incessant removal of the phosphates must tend to exhaust the land and diminish its capability of producing grain. The fields of Great Britain are in a state of progressive exhaustion from this cause, as is proved by the rapid extension of the cultivation of turnips and mangel-wurzel plants, which contain the least amount of the phosphates, and therefore require the smallest quantity for their development. These roots contain 80° to 92° per cent. of water. Their great bulk makes the amount of produce fallacious as respects their adaptation to the food of animals, inasmuch as their contents of the ingredients of the blood, *i. e.* of substances which can be transformed into flesh, stands in a direct ratio to their amount of phosphates, without which neither blood nor flesh can be formed. Our fields will become more and more deficient in these essential ingredients of food, in all localities where custom and habits do not admit the collection of the fluid and solid excrements of man, and their application to the purposes of agriculture. In a former Letter I showed you how great a waste of phosphates is unavoidable in England, and referred to the well-known fact that the importation of bones restored in a most admirable manner the fertility of the fields exhausted from this cause. In the year 1827 the importation of bones for manure amounted to 40,000 tons, and Huskisson estimated their value to be from £100,000*l* to £200,000 sterling. The importation is still greater at present, but it is far from being sufficient to supply the waste. Another proof of the efficacy of the phosphates in restoring fertility to exhausted land is afforded by the use of the *guano*, a manure which, although of recent introduction into England, has found such general and extensive application.

“We believe that the importation of one hundred weight of *guano* is equivalent to the importation of eight hundred weight of wheat; the hundred-weight of guano assumes, in a time which can be accurately



estimated, the form of a quantity of food corresponding to eight hundred weight; the same estimate is applicable in the valuation of bones."

We are glad that so interesting a work has received ample justice at the hands of the English Editor, and that the clear and popular style in which the work is written renders it well suited for the purposes for which it was intended.

## PATENTS.

*Patent granted to Frederick Parker, 138 New Gravel Lane, Middlesex, for Improvements in revivifying or reburning Animal Charcoal.*

It is well known that in refining sugar much animal charcoal is employed in the process of what is called discolouring the liquors (sugar dissolved in water), and that the animal charcoal so employed, after having been used for some time, requires to undergo a process called "revivifying," which, in fact, is a reburning or recharging; and for performing this operation various arrangements of apparatus have been employed, such as retorts, pots and ovens, closed as air-tight as possible during the time of applying heat to the same; and the modes or processes of operating with such apparatus have been,—1st, to permit the charcoal to remain to cool down in the same vessel in which it has been heated; this method, though beneficial as regards the quality of charcoal reproduced, is nevertheless tedious and costly, and it is likewise difficult to keep good joints; 2nd, the charcoal under operation having been heated to the extent required in closed retorts, pots or ovens, the charcoal, after opening the apparatus, has been drawn, in the highly heated state, through the atmosphere into coolers or vessels capable of being closed air-tight, or nearly so; which operation materially injures the quality of the charcoal reproduced.

The object of this invention is so to conduct the process of revivifying or reburning animal charcoal, that the retort, oven or vessel shall not require to be cooled down, and yet at the same time the drawing and cooling process shall not cause the charcoal to pass into the atmosphere when in a red-hot condition, or in a state to be injured thereby; hence, according to this process, the vessel, or the part wherein the heating takes place, and the vessel or receiver, or the part wherein the cooling takes place, are so arranged with respect to each other, that they may be connected, either temporarily or permanently, so as to exclude the air from the charcoal, from the time it enters the heating part of the apparatus until it leaves the cooling part in such a state as not to be prejudicially acted on by contact with the atmosphere.—Sealed June 22, 1839.



# THE CHEMICAL GAZETTE.

No. XXV.—November 1, 1843.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Composition of the Oil of Horseradish (Oleum armoraciæ).  
By C. HUBATKA.*

VERY few of the substances containing sulphur, which occur in nature, have hitherto been submitted to examination, with the exception of the proteine compounds. They are mostly volatile oils derived from Liliaceous or Cruciferous plants. The only one which has been minutely investigated is mustard-seed oil, from which numerous interesting results have been obtained.

The oil of mustard, as is well known, is not contained as such in the seed; it is first produced in the pounded seed on their being brought into contact with water, in a manner analogous to the formation of oil of bitter almonds from amygdaline. The oil exists already formed in the root of the horseradish, for on scraping it the well-known odour is immediately perceptible.

To prepare this oil, the root is cut into small pieces, and conveyed with two-thirds of its weight of water into a glass retort (a copper still cannot be used, as the oil is decomposed, and the interior of the vessel is rendered quite black by the sulphur); this is placed in the sand-bath, and connected with a Woulf's apparatus, and so submitted to distillation, care being taken to refrigerate well. The light, yellow-coloured oil is found at the bottom of the recipient. The water obtained in the first distillation is employed in the following ones, instead of pure water. 100 lbs. of horseradish afford from 5 to 7 drachms of crude oil. That obtained from the first distillation is redistilled with about 4 parts water, and placed over chloride of calcium, when it is obtained quite pure.

The pure oil is perfectly transparent, at the most only coloured slightly yellow, which becomes darker with time. Its specific weight = 1.01; the smell is penetrating, causes the eyes to water, and cannot be distinguished from that of the oil of mustard. Besides this smell, fresh horseradish has an odour of turneps, which alone is perceptible when the oil has been removed from them by distillation. A drop of the oil brought on to the skin causes violent burning, and produces blisters like oil of mustard. It is easily soluble in alcohol



and æther, very slightly in water. It is converted by chlorine gas into a thick dark mass, which melts at  $212^{\circ}$  with formation of hydrochloric acid and chloride of sulphur; on treatment with alcohol, a tenacious body having the odour of melted sulphur remains behind.

Concentrated nitric acid acts very violently upon it, giving off nitric oxide and depositing a light yellow porous mass (nitro-sinapyllic resin). When the nitric acid is allowed to act slowly upon it the oil is entirely destroyed, the sulphur being converted into sulphuric acid; but it is just as difficult to convert the whole of the sulphur into sulphuric acid as in the case of oil of mustard. With hydrated sulphuric acid the action is very violent, sulphurous acid being disengaged. It affords with ammonia a crystalline compound under the same conditions as oil of mustard, and in a similar manner. On digestion with recently-precipitated oxide of lead and evaporation in the water-bath, sulphuret of lead is obtained and a body which resembles sinapoline. In smell, specific weight, and in its behaviour towards reagents, the oil of horseradish is quite identical with oil of mustard, and on analysis 0.3328 grm. of oil afforded 0.5858 carbonic acid and 0.1575 water, which corresponds exactly to the composition of oil of mustard:—

		Calculated.	Found.
8 atoms carbon	606.83	48.60	48.41
5 ... hydrogen	62.40	5.00	5.26
1 ... nitrogen	177.04	14.18	
2 ... sulphur	402.33	32.22	
1 ... mustard oil	= 1248.60	100.00	

The combination with ammonia is white, beautifully crystalline, soluble in alcohol, æther and in water, free from smell, but of a bitter taste, melting when heated, and solidifying on cooling into a crystalline mass. It forms with oxide of mercury and hydrated oxide of lead a metallic sulphuret, and the liquid contains a substance resembling sinnamine. Sesquichloride of mercury and nitrate of silver produce voluminous white precipitates in the aqueous solution; the latter soon becomes black, with separation of sulphuret of silver.

On analysis 0.5923 grm. of the ammonia compound gave 0.883 grm. carbonic acid and 0.377 grm. water; 0.663 grm. of the ammonia compound gave 0.989 grm. carbonic acid and 0.413 grm. water.

It afforded 23.86 per cent. nitrogen.

		Calculated.	Found.	
8 atoms carbon	606.83	41.48	41.00	41.03
8 ... hydrogen	99.84	6.82	7.07	6.92
2 ... nitrogen	354.08	24.20		23.86
2 ... sulphur	402.33	27.50		
1 ... oil of mustard	1463.08	100.00		
ammonia ..				

The ammonia compound of the horseradish oil agrees therefore



also in composition with that of the oil of mustard. There is nothing to prevent us from asserting oil of horseradish and oil of mustard to be identical. It is remarkable that horseradish and mustard should have been selected as articles of food on account of one and the same substance, as is the case with tea and coffee.—Liebig's *Annalen* for August.

*On the Products resulting from the contemporaneous Action of Sulphur and Ammonia on Acetone.* By M. ZEISE.

When pure finely divided and dried sulphur is added to pure acetone, which has been carefully freed from water and saturated with dry ammoniacal gas, a considerable quantity of the sulphur is dissolved, forming a clear green liquid, which soon becomes brownish-yellow, and subsequently coffee-brown; it remains alkaline even when sulphur is present in great excess. If now more ammoniacal gas be passed into it, and some more sulphur be also added, a highly coloured reddish-brown syrupy mass is at last obtained, which has a strongly alkaline reaction, with a peculiar disagreeable smell resembling somewhat sulphuretted hydrogen. There is evident evolution of heat, but no disengagement of gas, certainly not of nitrogen. The ammonia is decomposed in this case in such manner that the nitrogen and hydrogen are divided between the sulphur, and the carbon hydrogen and oxygen of the acetone. The author has endeavoured to follow out the highly complicated series of metamorphoses which take place; his experiments relate principally to the behaviour of the original product formed at the ordinary temperature, to that obtained at a temperature up to  $122^{\circ}$  Fahr., then from  $122^{\circ}$  to  $203^{\circ}$ , from this point to  $248^{\circ}$  to  $392^{\circ}$ , and lastly up to  $527^{\circ}$ .

The original product dissolves entirely in alcohol and acetone, but æther leaves undissolved a brown resinous mass. From the brown æthereal solution a peculiar yellow body is thrown down by water, which the author has called *Thakcetone*. It is best obtained in the following manner:—The above product is made neutral with a solution of oxalic acid in æther, the liquid, filtered from the precipitated mixture of oxalate of ammonia and some resinous bodies, is then treated with water, upon which a little sulphate of lime is added in order to separate the remainder of the oxalate of ammonia; it is then evaporated to dryness, the dried mass extracted with alcohol, and the solution freed in this manner from sulphate of ammonia, finally dried over sulphuric acid.

*Thakcetone* forms a brownish-yellow mass resembling a varnish; it is decomposed by heat, and puffing up considerably affords sulphuret of ammonium, a dark brown oil very similar in smell to oil of hartshorn, and leaves behind a considerable quantity of coal which contains both nitrogen and sulphur. It dissolves abundantly in water, forming a deep-coloured liquid; it is also soluble in alcohol and æther, very slightly however in the latter; it behaves neutral towards the vegetable colours. Neither neutral nor basic acetate of lead causes any precipitate in its solution. A concentrated



solution affords with nitrate of silver a yellowish-white precipitate, which on being warmed in the liquid becomes brown; a dilute solution is not precipitated. On being heated with hydrate of potash it gives off ammonia.

When the original product is submitted, in a proper distilling apparatus, to a gradually increasing heat, it behaves essentially as follows:—At about  $122^{\circ}$  F. a somewhat violent evolution of ammonia and sulphuret of ammonium takes place, soon after which a bright yellow, thin liquid passes into the recipient. When the temperature is about  $203^{\circ}$  the disengagement of ammonia ceases almost entirely. The product of the distillation contains water, a little acetone, a small quantity of an oily body in solution, and lastly a considerable amount of ammonia and sulphuret of ammonium.

Between  $203^{\circ}$  and  $248^{\circ}$  only a liquid passes over; this separates into two layers, of which the upper one is brown and oily, the lower one yellow and aqueous.

At a temperature between  $248^{\circ}$  and  $392^{\circ}$ , besides a syrupy oil, a crystalline sublimate is obtained, which is deposited partly in the neck of the retort, partly in the recipient. It consists of sulphuret of ammonium and of several substances, one of which at least is of a peculiar nature; to this body the author has applied the name of *Akcethine*.

If the distillation be continued with a gradually increasing heat, the brownish-black thick fluid puffs up all at once, and gives off a small quantity of volatile products. The operation is discontinued at  $527^{\circ}$ , and the residue allowed to cool, when it forms a very porous, grayish-black brittle mass, resembling in its outward appearance coke.

On extracting this mass successively with alcohol, acetone, sulphuret of carbon and æther (which altogether remove about a quarter of it), a black pulverulent substance remains, which the author calls *Melathine*. With respect to the nature of the residue at other degrees of temperature, the author states that if the distillation be discontinued at  $392^{\circ}$  (*i. e.* before the puffing up occurs), and the residue be extracted several times with æther, a brownish-red body is obtained, which treated with alcohol affords a brownish-red solution, and a little melathine remains undissolved. Water precipitates from the alcoholic solution a substance, which dried is pulverulent and of a pure brownish-red colour; this substance is termed *Therythrine*.

The æthereal solution is dark brown. Submitted to distillation with a gradually increasing heat, the first portion that passes over is nearly pure æther, then æther containing an oil, upon this a brown oil and a little water, and at about  $338^{\circ}$  a crystalline sublimate, which consists for the greater part of akcethine. If the distillation be stopped at  $392^{\circ}$ , and the residue treated as above described, it is found to behave in a precisely similar manner.

*Akcethine* is most easily obtained in a pure state from the sublimate which is formed in the distillation of the above æthereal extract. The sublimate is dissolved in as little hot alcohol as possible,



the solution set aside to cool, when the akcethine separates in yellow rhombic crystals, which are sometimes of pretty considerable size. They are pressed between paper, and purified by recrystallization.

Akcethine thus prepared is of a pure yellow colour; the crystals are generally transparent and possess considerable lustre; it has scarcely any taste. It melts at about  $302^{\circ}$  to a clear limpid sulphur-yellow body, which becomes reddish-brown and thick at a higher temperature, but on cooling solidifies to a yellow radiately crystalline mass. At a moderately elevated temperature it forms yellowish vapours, and the whole is soon volatilized, without the least decomposition or any perceptible separation of water, as a yellow crystalline body, which resembles in every respect the crystallized akcethine obtained in the moist way. Only when the vapour is passed over a too strongly heated part of the neck of the retort is some sulphuret of ammonium formed, and at the same time a separation of a carbonaceous mass. Held in the flame of a spirit-lamp, it melts to a dark brown mass without burning distinctly at first. It affords ammonia on boiling with strong caustic potash-ley; dilute hydrochloric and sulphuric acids dissolve it without any perceptible change, and in about the same proportion as water. Nitric acid behaves similarly at the ordinary temperature, but when heated with it, it is decomposed with separation of flakes resembling sulphur, and by prolonged boiling with strong nitric acid, a liquid containing a large amount of sulphuric acid is obtained.

Akcethine is somewhat difficult of solution in water, more easily in æther, and still more so in alcohol and acetone. The solutions are yellow, and have a slightly alkaline reaction on red litmus paper. The aqueous solution may be boiled for a considerable length of time without any decomposition resulting. Salts of lead, proto- and per-salts of iron (the two latter either separate or mixed) cause no precipitate nor any change of colour in an aqueous solution of pure akcethine. Nitrate or sulphate of silver, on the contrary, when added to a highly concentrated solution, produce instantly a very voluminous pale yellow precipitate, which in the course of five or ten minutes is converted into a snow-white powder; the precipitate forms in a dilute solution only after some length of time.

The brownish-red body (*Therythrine*), obtained in the manner above described, is nearly insoluble in water; pure æther, free from alcohol and water, also dissolves but little of it; but it dissolves readily in alcohol, acetone and sulphuret of carbon, and likewise in considerable quantity in concentrated sulphuric acid, and in strong solution of caustic potash, without any apparent decomposition. The solutions are of a very deep brownish-red. The alcoholic solution affords, on evaporation to dryness, a dark red, brittle, resinous mass; under no circumstances could the therythrine be obtained in a crystalline state. An alcoholic solution of therythrine is not thrown down by acetate of lead, but nitrate of silver produces a large dark red precipitate. It melts like a resin on being heated above  $212^{\circ}$ ; at a higher temperature it is decomposed, and affords in small quantity a brown oil of a disagreeable smell, sulphuret of



ammonium, and leaves behind a shining coal of very difficult combustion.

The black substance (*Melathine*) is entirely insoluble in water; it is likewise very sparingly soluble in alcohol, acetone, æther, or in sulphuret of carbon. Hydrochloric acid has no action on it, but concentrated sulphuric acid affords a brown liquid, from which water separates brown flakes. Submitted to distillation it affords a trace of an oily substance, without however first melting, and a very large quantity of a gas which contains much sulphuretted hydrogen, and leaves behind a carbonaceous mass. It is very difficult to burn even with chlorate or nitrate of potash. When burnt with a sufficient quantity of chlorate of potash, a large amount of sulphate of potash is formed.

The author extracted the brown-coloured body from the residue of the distillation at  $392^{\circ}$  in the following manner:—The brown solution obtained by exhausting the residue with æther was treated with water, which removed among other things the remaining akcethine. The precipitate was then redissolved in æther, and in order to separate as much as possible the volatile oil, the solution was first evaporated at a gentle heat, and then dried over sulphuric acid.

Both this, as well as the brown body obtained as above described from the original product, is insoluble in water, but soluble in æther, alcohol and acetone.

From the brown oily and tar-like product obtained by distillation between  $248^{\circ}$  and  $356^{\circ}$ , the author endeavoured to obtain a distinct substance in the following manner:—The product of the distillation was dissolved in æther, and alcohol added to the filtered solution. The liquid was then shaken frequently with water, adding now and then more alcohol, after the separation of the yellow solution of akcethine and several substances in the mixture of water, alcohol and æther. The strongly alkaline solution which remained was neutralized with a solution of oxalic acid in æther, and the deposit which resulted separated from the liquid, which was then again shaken with several portions of water until this ceased to acquire a yellow colour. The filtered liquid was then submitted to distillation with a gradually increasing temperature. After all the æther had been expelled, the clear brownish-yellow oily liquid, which passed over between  $284^{\circ}$  and  $302^{\circ}$  Fahr., was collected separately, as at the latter temperature a turbid brown oil began to make its appearance, indicating a decomposition of the residue. The brownish-yellow oily body thus obtained possesses in the highest degree the peculiar and most disagreeable odour which prevails during researches of this kind, as this oil accompanies, in larger or smaller quantity, the formation of all the other bodies. To this body the author has given the name of *Elathine*.

*Elathine* is lighter than water and insoluble in it; it cannot be distilled in the usual manner without being partially decomposed; it burns with a very smoky flame giving off sulphurous acid, but it is not easily inflamed. On shaking it with a strong aqueous solution of potash, and leaving it for some time in contact, it affords



a liquid which contains a considerable amount of sulphuret of potassium; with an alcoholic solution of potash it first forms a clear solution, but this subsequently deposits a white substance, which appears to be sulphuret of potassium.—*Journ. für Prakt. Chem.*, xxix. p. 371.

*On the essential Oil of Pinus Abies.* By Prof. WÖHLER.

The odour in a forest of firs is not that of oil of turpentine; it is far more agreeable and aromatic. It is most perceptible in young trees. The conversion of the ordinary oil of turpentine into pine-resin has never yet been effected artificially, although it appears to take place in the turpentine exuding from the trees; and the composition of the oil and resin are in such a relation to each other, that if we suppose 8 atoms of oil of turpentine to absorb 6 atoms of oxygen and to lose 2 atoms of water, pine-resin would result. Oil of turpentine brought into contact with hydrate of potash in a state of fusion is not converted into sylvic or pinic acid. Perhaps the tree does not produce the ordinary oil of turpentine, but another isomeric oil having different properties, but which is gradually converted of itself, or owing to the mode of obtaining it, into oil of turpentine. It may also be that different oils are contained in the various parts of the tree, that in the root being distinct from that in the branches. M. Gottschalk submitted a quantity of fresh young branches of fir (*Pinus Abies*), which had been freed from resin and from the cones, to distillation with water; a thin colourless oil was obtained, entirely distinct in smell from oil of turpentine, which immediately called to mind that of the fresh branches of fir, but at the same time had some resemblance to that of fat laurel oil. Its boiling point was 333° Fahr. It dried very quickly by exposure to the air, forming a clear varnish; its odour was not changed by distillation with moderately concentrated caustic potash; but when it was distilled with fused crystallized hydrate of potash it acquired the smell of oil of turpentine, so that there cannot be the least doubt of its conversion into this latter. The potash then contained a small quantity of resin.

The crude oil obtained from the branches deprived of water gave on analysis—

Carbon	87.07
Hydrogen	11.89
Oxygen	1.04

A portion of this oil which had been redistilled gave—

Carbon	87.40
Hydrogen	11.77
Oxygen	0.83

The crude oil is therefore evidently a mixture of an oil containing no oxygen with a small quantity of one containing this element. This was more evident from its behaviour towards potassium. The metal placed in the cold dried oil caused only for a few minutes the liberation of a small quantity of hydrogen gas, with formation of an



inconsiderable quantity of a light brown gelatinous mass, which imparted a brownish-yellow colour to the oil. The potassium then remained unchanged and bright, floating on the oil, while at first it sunk to the bottom. The oil has moreover acquired a perfectly distinct and far more agreeable odour, which was most evident when it had been rectified either alone or with some pieces of potassium. It possessed an odour intermediate between oil of lemons and oil of orange. It was very fluid, possessed a high refractive power, and boiled at  $333^{\circ}$  Fahr. Its specific weight was 0.856. It absorbed hydrochloric acid gas in large quantity with evolution of heat, but without forming, even at  $32^{\circ}$  Fahr., a solid compound. The analysis of this aromatic oil proved the per-centage composition to be identical with that of the oil of turpentine. The analysis afforded—

Carbon .....	88.38
Hydrogen .....	11.78
	<hr/> 100.16

Liebig's *Annalen* for August.

*On the Non-precipitation of Lead from Solution in Sulphuric Acid by Hydrosulphuric Acid. By M. DUPASQUIER.*

When a current of hydrosulphuric acid is passed through, or an aqueous solution of this acid gas is poured into, commercial sulphuric acid diluted with an equal weight of water, only tin and arsenic, if they be present, are precipitated; and the precipitate contains no sulphuret of lead. As to the iron which the sulphuric acid contains, it is well known to be the protosulphate, upon which hydrosulphuric acid has no action.

The non-formation of sulphuret of lead in this case had led the author to think, contrary to the general opinion, that commercial sulphuric acid does not contain sulphate of lead, and consequently that this metal is completely insoluble in it; but on trial he adopted a contrary opinion. The following experiments were performed:—

1. Recently precipitated sulphate of lead was put into a glass and covered with concentrated sulphuric acid, and exposed to the air during about six months, taking care to shake the mixture occasionally. The acid was considerably diluted by absorbing atmospheric moisture. This acid, rendered clear by standing, was submitted to the action of a current of hydrosulphuric acid gas without occasioning any discoloration or precipitation of sulphuret of lead.

2. Sulphuric acid of sp. gr. about 1.540, was boiled for an hour on sulphate of lead, and afterwards the experiment was repeated with concentrated acid. The liquids rendered clear by standing were treated with a current of hydrosulphuric acid gas, but neither precipitation of sulphuret of lead nor discoloration were produced.

These experiments seem to prove that even boiling concentrated sulphuric acid does not dissolve sulphate of lead, and consequently that the acid of commerce cannot contain any; but on adding water to the acids which had been boiled with the sulphate of lead, after



they had become clear, a considerable white precipitate was formed; this could only be attributed to the separation of the acid from the sulphate of lead which it had dissolved, an effect which is precisely similar to the precipitation of sulphate of barytes dissolved by concentrated sulphuric acid.

An aqueous solution of hydrosulphuric acid was then added to the acid which had been treated with water, and still holding in suspension the white precipitate which had been formed; but neither the liquid nor the precipitate was rendered brown by the hydrosulphuric acid: they remained perfectly colourless. From these facts M. Dupasquier began to suspect that sulphuric acid prevented the formation of sulphuret of lead; that this is actually the case was proved by the following experiment:—

Sulphate of lead was put into a glass and covered to about  $1\frac{1}{2}$  inch of concentrated sulphuric acid, agitation being used to effect their mixture. Being afterwards subjected to the action of hydrosulphuric acid, both in its gaseous state and in solution, the mixture remained perfectly white. The same result was obtained by causing hydrosulphuric acid to react upon sulphuric acid, which had been boiled with sulphate of lead, and then mixed with this salt; in neither case was there the slightest formation of sulphuret of lead.

In order to prove that the discoloration both of the dissolved and undissolved sulphate of lead was owing to the presence of an excess of sulphuric acid, the following experiments were performed:—

1. The precipitated sulphate of lead was washed with distilled water, and treated with hydrosulphuric acid, when it became immediately black.

2. Sulphuric acid which had been boiled with sulphate of lead was saturated with potash; in this state a current of hydrosulphuric acid immediately rendered it black, and on standing a deposit of sulphuret of lead was formed.

It follows from what has been stated,—

1st. That a small portion of sulphate of lead is soluble in concentrated sulphuric acid.

2nd. That hydrosulphuric acid does not react upon sulphate of lead dissolved in a great excess of sulphuric acid, or mechanically mixed with it.

3rd. That consequently, hydrosulphuric acid cannot be employed for the purpose of ascertaining the presence of sulphate of lead in commercial sulphuric acid.

4th. That boiling concentrated sulphuric acid dissolves some sulphate of lead, the greater part of which is precipitated on the addition of water.

5th. That hydrosulphuric acid immediately reacts, and sulphuret of lead is instantly formed from the sulphate whether it is dissolved or not; when the excess of sulphuric acid is saturated by an alkaline base; from which it evidently results, that it is the excess of sulphuric acid that prevents the reaction of the hydrosulphuric acid on the oxide of the sulphate of lead.—*Journal de Pharmacie et de Chimie*, Août, 1843, and *Philosophical Magazine* for October.



*On the Action of Chlorine on Carbonic and Succinic Æthers.**By M. CAHOURS.*

The author found M. Ettling's statements respecting the formation of carbonic æther perfectly correct. It is formed at the same time with carbonic oxide and oxalate of potash, when oxalic æther is treated at a high temperature with potassium. It is a clear colourless liquid, which has an æthereal smell, a burning taste, volatilizes at 257° Fahr. without decomposition, floats upon water, in which it is insoluble, but is easily soluble in alcohol and æther. The specific weight of the vapour is 4·09; the calculation gives 4·07 for

10 volumes vapour of carbon ..	=	4·140
10   ...   hydrogen .....	=	0·689
3   ...   oxygen .....	=	3·308
		<hr/>
		8·137
		<hr/>
		2
		= 4·069

It thus presents the same molecular arrangement as the oxalic æther from which it is derived.

It afforded on analysis—

	Found.	Atoms.	Calculated.
Carbon .....	50·72	5	50·9
Hydrogen.....	8·67	10	8·5
Oxygen.....	40·61	3	40·6

If chlorine gas be passed into carbonic æther in a glass retort and in diffused light, it is absorbed with evolution of heat and hydrochloric acid gas; towards the end of the operation it is necessary to heat it to between 158° and 180° Fahr. When the action of the chlorine appears to have ceased, the product is conveyed into another apparatus, in which it is treated between 158° and 167° Fahr. with dry carbonic acid gas, in order to expel the chlorine and muriatic acid gas. The product thus purified is a colourless liquid, which has a sweetish odour, sinks in water, dissolves in alcohol, may be distilled without decomposition, and which is not further altered by longer treatment with chlorine gas in diffused light, and consists of—

	Found.		Atoms.	Calculated.
Carbon.....	23·36	23·31	5	23·47
Hydrogen .....	2·40	2·42	6	2·35
Oxygen .....			3	18·85
Chlorine .....	55·48		4	55·33

But if this product be left in contact with chlorine gas in the direct light of the sun, more hydrochloric acid vapours are given off, and on employing about 10 grms. the whole is converted in about three or four days into a crystalline mass, which however cannot be recrystallized without decomposition, and can only be dried by pressure between blotting-paper and washing with æther, upon which it is placed in vacuum. It then forms a snow-white tissue of small needles, of a faint smell, which consists of—



	Found.			Atoms. Calculated.	
Carbon . . . . .	13.43	13.35	12.78	5	12.98
Hydrogen . . . . .	0.23	0.23	0.16		
Oxygen . . . . .				3	10.40
Chlorine . . . . .	76.69			10	76.62

The action of chlorine upon succinic æther appeared to decide the question whether succinic acid be a monobasic acid  $= C^4 H^4 O^3 + H^2 O$ , or a tribasic acid  $= C^8 H^6 O^5 + 3H^2 O$ , which latter view (according to which crystallized succinic acid corresponds to Arcet's phosphoric acid, and the so-called anhydrous succinic acid to the metaphosphoric acid) agrees well with M. Fehling's results. In the first case the *whole* of the hydrogen of the succinic æther would be substituted by chlorine; in the second, on the contrary, in which this æther  $= C^8 H^6 O^5, 2C^4 H^{10} O, H^2 O$ , a substitution of the equivalent of hydrogen existing as water is not possible. Nor is this the case.

The author endeavoured in vain to obtain a monobasic succinic æther by treating a solution of so-called anhydrous succinic acid in absolute alcohol with muriatic acid gas. The product was ordinary succinic æther, as it combined with the water formed at the same time with chlorethyle. The analysis of the æther afforded—

	Found.	Equiv.	Calculated.
Carbon . . . . .	55.04	16	55.17
Hydrogen . . . . .	8.18	28	8.05
Oxygen . . . . .	36.78	8	36.78

The specific gravity of the vapour was found to be 6.11; calculation requires, under the supposition of a quadruple condensation, 6.06.

M. Malaguti has already shown that chlorine gas expels at the commencement 2 equivalents of hydrogen from the succinic æther. If this first product be further treated with chlorine gas in the direct light of the sun, a white crystalline mass is finally obtained, with brisk formation of hydrochloric acid. This is not further changed by chlorine gas, even in the strongest light; it is purified by pressure between bibulous paper, washing with æther, and recrystallization from absolute æther, and then forms a tissue of snowy-white acicular crystals, which dissolve in alcohol and æther, but not without some change. This product consists of—

	Found.			Equiv. Calculated.	
Carbon . . . . .	15.15	15.22	15.37	16	15.45
Hydrogen . . . . .	0.28	0.19	0.20	2	0.16
Oxygen . . . . .				8	10.30
Chlorine . . . . .	74.25			26	74.09

This mode of viewing succinic æther, in which its vapour is supposed to undergo quadruple condensation, as in the other æthers, appears to favour a similar doubling of the formulæ for oxalic and carbonic æther, which would do away with the last exceptions to the general law of condensation which prevails among the æthers.—

*Comptes Rendus*, July 31.



## ANALYTICAL CHEMISTRY.

*On the Action of Sulphurous Acid on the Salts of Copper.*

*By M. VOGEL.*

WHEN I published, about thirty years ago, my experiments relating to the action of sulphurous acid on various metallic oxides, I considered it certain that the deuto-sulphate of copper might be reduced to the state of proto-sulphate by means of sulphurous acid. In the course of this year however M. Berthier has advanced the opinion that the salts of copper in solution are not reduced by sulphurous acid, either with or without the assistance of heat. The authority of this celebrated chemist has induced me to turn my attention again to this subject\*.

I was led to the idea of a partial reduction by the observation, that when a solution of sulphate or nitrate of copper was gently heated with some sulphurous acid, the solutions are no longer precipitated blue by potash, but rather of a *yellow* colour. It is true that the solutions of these two salts of copper do not deposit any protoxide of copper in powder by the action of sulphurous acid; but this I attributed to the acid which is set free not allowing of a precipitate being formed.

To avoid this inconvenience I employed a salt of copper in which the separation of acid was not to be feared. I poured some sulphurous acid over hydrated carbonate of copper which had been recently prepared. The solution, which took place readily and with effervescence, deposited, on being gently heated, some protoxide of copper of a brownish-red colour, and there remained but very little copper in the solution. This reduction in the carbonate of copper and formation of the protoxide in the state of a red powder likewise took place, although with greater difficulty, with the native carbonate of copper. If, for instance, the blue carbonate of copper of Chessy, reduced to a fine powder, be heated with sulphurous acid, it dissolves, and is subsequently converted into brownish-red protoxide, which is deposited. As in these two cases the carbonic acid is given off, and no great excess of sulphurous acid has been employed, there is nothing to prevent the separation of the protoxide. M. Berthier has also observed that some protoxide is formed when carbonate of copper, either artificial or native, is treated with sulphurous acid.

The arseniate and phosphate of copper, heated with sulphurous acid, do not deposit any protoxide, because the energetic acids which are set at liberty in this instance prevent the separation of the protoxide; but the solutions of the phosphate and arseniate of copper in the sulphurous acid are precipitated *yellow* by potash. M. Berthier however has observed that the phosphate and arseniate of copper are reduced to the state of protoxide by boiling with sulphite of ammonia, which salt I did not employ in my experiments.

\* See M. Berthier's Memoir on some separations effected by means of sulphurous acid or of the alkaline sulphites, p. 318.



If, on the contrary, arsenite of copper be heated with sulphurous acid, protoxide is deposited immediately as a brownish-red powder, which the arsenious acid set free is not able to dissolve. I have moreover found by experiment that the arsenious acid itself undergoes no reduction from the action of the sulphurous acid.

I had mentioned in my paper that a solution of the acetate of copper deposited rapidly protoxide of copper when sulphurous acid was conveyed into it; the acetic acid liberated in this operation is partly volatilized by the boiling, and has not the property of redissolving the deposited protoxide. The formiate of copper is likewise reduced by sulphurous acid, and deposits protoxide in a red powder. In the same manner a blue solution of oxide of copper in ammonia is reduced by means of sulphurous acid, and the protoxide is deposited as a red powder combined with a small quantity of sulphurous acid.

From these experiments it appears to me to be beyond doubt that all the salts containing oxide of copper as base are reduced to the state of protoxide by sulphurous acid, and that the oxide is deposited only in those cases in which the oxide of copper is not combined with a strong acid.—*Journ. de Pharm. et de Chim.* for October.

*On the Quantitative Determination of Manganese. By M. EBELMAN.*

In general manganese is determined quantitatively, in analytical researches, in the state of red oxide; but this oxide has the property of absorbing while cooling a certain amount of oxygen, and of passing into the state of sesquioxide, which renders the result uncertain.

It seemed to me preferable to determine manganese quantitatively in the state of protoxide, by reducing the higher oxides by hydrogen. To perform this experiment in an easy manner, I employ a platinum crucible, the lid of which has a short tube in the centre; a current of pure and dry hydrogen is conveyed, by means of a green glass tube of a diameter nearly equal to that of the tubulure, into the crucible, and heat applied by means of a spirit-lamp; the reduction is complete after a few minutes. A rapid current of gas is passed into the crucible while cooling. The oxide of manganese obtained dissolves in hydrochloric acid without rendering it black and without disengaging chlorine. The use of a crucible of platinum, provided with a tubulated lid, is extremely useful in many analytical investigations, where it is desirable to act on solids with gases. In these cases, when the substances submitted to the action of the gas might attack the platinum, a porcelain crucible with a platinum lid should be employed. This apparatus is an advantageous substitute for tubes with bulbs, the employment of which is inconvenient, both as regards the weighing of them, as well as in the introduction of the substances.—*Ann. de Chim.* for August.



## PHARMACOLOGY.

*Observations on Musk.*

THIS substance is found secreted in a bag attached to the male musk deer, whose habitat is in the mountainous Kirgesian and Sanguorian steppes of the Altai, on the river Irtysh. It exists also in Mongolia, Thibet, and Butan or Bontan, as far as Tonquin, and generally on the mountains of Eastern Asia, ranging between 30° and 60° of latitude.

In trade two distinct species of musk are known, comprising the Chinese Tonquin, Thibetian or Oriental musk, and that which includes the Siberian, Cabardinian, or Russian musk. These varieties, the one Russian and the other Chinese, differ materially both in external appearance of the bag and the colour of the hair which covers it, as well as in their chemical and physical properties, and different effects on the human constitution.

These differences exist chiefly on account of the difference in climate which the animals inhabit, and the food which such variations in temperature occasion. Dr. Göbel is of opinion that these different properties of Chinese musk, as compared with the Russian, should be attributed to the difference of treatment which they undergo in China, and he considers that the Chinese musk is the natural product after it has been subjected to the ingenious adulterations of the Chinese\*. The following are the reasons for this supposition:—

Irbit, a small town of Asiatic Russia, known chiefly for the considerable barter-trade which is there carried on in the month of February between Russian, Bucharian, and Chiwinzian tribes, with Persian, Armenian, and other Asiatic nations, is the main market for Siberian musk. It is less frequently taken to the market of Nischnei Novgorod. The Asiatics bring to Irbit the musk bags enveloped in the original grayish-white skin, as cut from the musk deer, and sell them, either to the Russians, who carry them to St. Petersburg and Moscow, or they dispose of them to Russian traders, who carry on a commerce with China by Kjachta.

The Russian merchants, who bring the musk from Irbit to St. Petersburg and Moscow, trade only between these towns and Irbit; but those who carry it to Kjachta trade only between the said town of Kjachta and Irbit.

In case the price of musk is remunerating at St. Petersburg and Moscow, then the Russians who trade there purchase the musk bags, and pay good prices; on the other hand, when it is low in these places, the Asiatic finds his customer in the trader to Kjachta. Sometimes it is brought to St. Petersburg in large and sometimes in small parcels, occasionally packed in chests, whilst at others it is loosely carried in bags of leather or felt, and sold generally to druggists.

\* See page 658 of this Journal.—Ed.



The price of musk at St. Petersburg is regulated by the quantity of stock in hand. The Russian trader procures European wares with the produce of his sale, which wares are destined to procure at Irbit a further supply of the drug. At St. Petersburg it is packed in tin caddies, hermetically soldered, and when exported these are packed in small wooden cases.

The Irbit musk is invariably enveloped in the grayish-white belly skin, and the bags are separated when it is sent to St. Petersburg, this being done only after it has been sold to the St. Petersburg trader; for a bag accompanied with the skin rarely arrives at St. Petersburg. If however the musk is sold to those traders who proceed with their wares for the Chinese market *via* Kjachta, this appendage is indispensable, because the Chinese, who exchange tea for it, would not purchase it except in its original state. From Kjachta it is taken into the interior of China, and the process of adulteration it there undergoes is entirely unknown; but it is a fact, the authenticity of which is indisputable, that no Russian musk bag is ever reimported from China *via* Kjachta, the only trading mart between Russia and China; and further, that not a single bag of Chinese musk ever arrives in Russia *via* Kjachta.

In one year, 300, 400, and even upwards of 500 lbs. of Russian musk have been carried to China by Kjachta. In such years it may be presumed that but little musk arrived at St. Petersburg, where the rise and fall of the market price is governed by the quantity imported.

From St. Petersburg and Moscow there is annually exported a quantity of Russian musk, amounting on an average to 500 lbs. Perhaps one half of this quantity is destined for the London market, where more especially the smallest bags are in demand, whilst the remainder is distributed amongst other European markets, more especially those of Holland and Germany, where the greater part is consumed.

The Russian musk, when exported from Russia, is always genuine and unadulterated; the bags never being opened, are consequently never sewn, or closed in any artificial manner. Sometimes it is obtained so fresh that moisture may be expressed therefrom by cutting through the fleshy side of the bag. The interior mass is frequently of a soft and pappy consistence; externally however the bags are perfectly dry.

Dyrssen, an eminent Russian merchant, proved to Dr. Göbel, by his books, that he annually exported, on an average, about 200 lbs. of Russian musk, and he stated that through other houses at least a similar aggregate quantity was sold; and lastly, from Moscow, in the winter, there was sent, *via* Brody, to Vienna, and through other channels, at least 100 lbs., giving an annual total of 500 lbs. of Russian musk, which was rather below than above the average quantity exported.

That which is termed Tonquin or Chinese musk comes into the market only through the London trade, and by no other channel; although much of this is consumed in Russia, no bag being ever



received *via* Kjachta, but always imported directly from London. These Chinese musk bags are found, on examination, invariably to have been opened, and more or less carefully glued together; sometimes indeed the stitches are visible by which they are held together.

We have the assurance of Dyrssen, that during the many years he has been engaged in trade, although he has frequently received quantities of from 100 to 200 oz. at a time from London, yet in no case whatever has he met with a bag which had not been opened, and closed with more or less ingenuity. He believes also that he has recognised the Siberian bags, although somewhat modified. Whether the Chinese musk, in its peculiar package, is received in that state at the English factory at Canton, as is most probably the case, or whether it is there made up, we are not in a position to state. Dr. Fr. Göbel relates, that in the year 1825 he received, through Jobst and Klein of Stuttgard, a Chinese musk bag, to which was adherent a portion of the skin attached to the belly; this Dr. Göbel opened in the presence of the eminent naturalist Oken, and it was represented by Ratzeburg and Brandt in their description of officinal animals, and of which Oken gave an account in his '*Isis*,' and which appeared also in Kastner's '*Archives*.' This bag, which the doctor has still in his possession, was of the same form, and in colour and size of the hairs precisely similar to the Russian musk bag, with which he had an opportunity of comparing it whilst on a visit to Russia. The contents however of this musk bag differed materially, in their chemical and physical properties, from those of the pure Siberian musk bag. Buchner, in his '*Repertory*,' has given a description of a musk bag, which coincides with that in Dr. Göbel's possession. The weight of grain musk from this bag was 225 grs., and cost 30 thaler, about £4 10s.

If we take a Chinese musk bag, with its partially bald surface and yellowish-brown hairs here and there cut off, and soften the same by digestion in warm water, we perceive pretty plainly that it has been subjected to artificial changes. The external skin is tender, and may be easily torn, as if it had been destroyed by partial decomposition; the hairs have either fallen off or been removed by force; indeed the longer hairs clearly appear to have been cut off.

Why do not the musk bags from China arrive as perfect as those from Russia? Because the contents have been removed and the bags refilled, as may be distinctly perceived by the circumstance of those hairs which surround the interior small opening which is found on the hairy side of the bag, immediately before the genital canal, being depressed; whilst in the Russian musk bags these small hairs are found standing obliquely, and protruding in and between the secretion. It is possible, although not at all probable, that the musk deer, which abound in Thibet, Butan, &c., may possess musk bags of a perfectly distinct character from the Russian, but no trustworthy reference or practical judge has ever witnessed the removal of such a bag from the living animal, or described it and its contents. That the grain musk of the Chinese musk bags which have been brought to Europe differs very much in its effects, as well as in its physical



and chemical characters, from the pure Siberian, has been ascertained; and that it likewise acts with more energy on the living œconomy when administered internally. All the different chemical investigations of musk, for which we are indebted to Buchner, Wetzlar, Oberdörffer, Thiemann, Blondeau, Guibourt, Geiger and Reimann, &c., taken together, afford very few hints in reply to those questions, which involuntarily present themselves, in reference to the two different kinds of musk, so far as regards their chemical and mercantile relations.

Taking therefore the most essential points of the preceding communication,—1st, that the Russian musk is always sold in perfect bags, and exported in considerable quantities to China and to London; 2nd, that from China to Russia no direct exportation of musk takes place; 3rd, that the Chinese musk can only be obtained *via* London; 4th, that the Chinese musk bags never arrive unopened; 5th, that it appears most undoubtedly that the mass has been taken out and replaced; 6th, that the external appearance of the bags proves sufficiently that they have undergone artificial treatment; 7th, that frequently the secretion, apart from the bag, is imported from China, leading to the inference that a sufficient number of bags cannot be obtained wherein to put the quantity increased by adulteration; taking all these reasons into consideration, we think the conclusion announced at the commencement cannot be avoided, viz. that the distinctly marked difference of the Chinese from the Russian musk, if not wholly, is at any rate chiefly, caused by the treatment which it undergoes in China, and therefore that Chinese musk is the natural product after it has been modified by artificial means.

It is a fact worthy of remark, as showing the ignorance which exists in reference to the places whence products are obtained, that notwithstanding the fact that London receives the greater quantity of Russian musk, yet that in the Trades' List and Prices Current no mention is ever made of Siberian or Cabardinian musk.

In reference to the quantity of musk on which duty has been paid, we find, on referring to the Customs' official documents, that in the year 1842, up to June 28th inclusive, the duty of 6*d.* per oz. was paid on 1643 oz., whilst during the same term in 1841 only 501 oz. were cleared.

At the port of London alone, from June 1841 to June 1842, duty was paid on 969 oz.—*Polytechnic Review*, Oct. 21, 1843.

*On the Poisonous Nature of the Yew (Taxus baccata).*

*By M. RÖTTSCHER.*

Although doubts have been expressed by several writers respecting the poisonous action of the yew, yet a case of poisoning which occurred recently sufficiently proves the contrary. A countryman who had brought in a load of turf to town placed his three horses in the neighbourhood of a yew tree; two of these horses, which had eaten of the young shoots, died, one in a quarter of an hour, the



other on its return home; the third, which had been placed so that it could not reach the yew, remained in perfect good health.

On examination distinct traces of poisoning were perceptible.—*Archiv. der Pharm.* for September.

*Spurious Aloe Socotrina.*

MM. Hopf and Bley notice the occurrence of this drug in commerce after its having been extracted with water.—*Archiv der Pharm.* for September.

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## CHEMICAL PREPARATIONS.

### *On the Preparation of Chromic Acid.*

TO WILLIAM FRANCIS, ESQ.

DEAR SIR,

ABOUT five or six years ago I suggested a process for preparing chromic acid, which I have since, on many occasions, found very convenient; and as it is probable that it was not then made known to chemists in general, you may perhaps deem it worth while to allude to it in connection with some of the articles which have lately appeared in your Gazette; not that I would bring it forward in the place of those now proposed, but as being a process useful in some cases, and likely to be considered to advantage by those who are at work on the subject.

The process is simply this:—Take chromate of mercury or silver, and act upon it with dilute hydrochloric acid, adjusting the proportions so that there shall not be an excess of either; the chloride will easily subside, and the clear solution of chromic acid may be decanted after the liquid has remained at rest for a few minutes only.

In this way I have found a stock of chromate of mercury almost as convenient as a ready-made solution of chromic acid, and have had no difficulty in adjusting the proportions of acid and chromate with sufficient accuracy for all ordinary purposes.

By mixing solutions of bichromate of potash and nitrate of silver, and after washing the precipitate acting upon it with muriatic acid, a solution of chromic acid may at any time be obtained from reagents always within the chemist's reach. The substances are expensive, but of course there need be no loss, and, if you think with me, the process may prove useful to photographers, or others who require small quantities of chromic acid, perhaps you will give it a humble place in your Journal.

I am, dear Sir,

Yours truly,

Liverpool, Oct. 17, 1843.

WILLIAM H. BALMAIN.



*New Formula for arsenical Solution.* By Dr. A. DEVERGIE, Physician to the Hospital of St. Louis.

Fowler's solution is, as is well known, so powerful a medicine, that it can only be prescribed in drops, and the least error in the dose may give rise to very serious accidents. Dr. Devergie, on this account, proposes to substitute for Fowler's formula the following one, which allows of the most minute doses of arsenite of potash being prescribed in grammes:—

R <sub>x</sub> Arsenious acid . . . . .	0·10 centigrammes.
Carbonate of potash . . . . .	0·10      ...
Distilled water . . . . .	500·00 grammes.
Compound tincture of lavender	0·50 centigrammes.
Tincture of cochineal, <i>q. s.</i> to colour strongly.	

Each gramme of this solution represents a five-millionth, or 0·0002, two ten-millionths of a gramme of arsenious acid; while each gramme of Fowler's liquor contains 0·01, one centigramme, and is therefore 50 times stronger than the preceding.

Fowler's solution is prepared according to the following formula:—

R <sub>x</sub> Arsenious acid . . . . .	5 grammes.
Carbonate of potash . . . . .	5      ...
Distilled water . . . . .	500      ...
Compound tincture of lavender . . . .	1      ...

The observations of Dr. Devergie have been approved of by the Council General of Hospitals, which has authorized the use of the new preparation. The author advises giving it a deep rose colour, in order that it may be distinguished at sight, and he has assigned to it the name of *Devergie's Mineral Solution*.

It may however be observed that each gramme of this solution does not represent, as stated by Dr. Devergie, a drop of Fowler's arsenical solution, but about half a drop; in fact, on adopting the weight of 70 grammes, attributed by the Codex, to 20 drops of distilled water, it will be seen that 1 gramme corresponds to about 28 drops, and not to 50, which it ought to do, if a gramme of Dr. Devergie's solution represented in reality a drop of Fowler's solution, this being 50 times stronger than the former.—*Journ. de Pharm. et de Chem.* for October.

*On the Preparation of the Aqua Amygdal. Amar. and of Aqua Lauro-Cerasi.*

M. Hænle has found that a very excellent almond water may be prepared by first mixing the almond cake with water to a paste, heating the remainder of the water in the still to boiling, and then conveying into it quickly the almond paste. For instance 2 lbs. of bitter almonds, which have been freed from oil by cold pressing, are again reduced to powder, and macerated for twelve hours in a closed vessel with 6 lbs. of pure water; 6 lbs. of water free from carbonic acid are heated to boiling in the still, during



which time the refrigerator is connected by means of moist bladder air-tight with a tubulated recipient, and a tube bent at right angles fitted in the same manner into the tubulure, the longer arm of which is inserted into a vessel 2 inches beneath the surface of the distilled water. The mixture is poured rapidly into the still, the helm placed on immediately, luted, and the distillation carried on with care. When 14 to 18 oz. have passed over the product is removed, shaken with the oil, and the 6 to 10 oz., which subsequently distil over, preserved separately; ammoniacal nitrate of silver, acidulated with nitric acid, is added to half an ounce of the first product, and the precipitate brought on to one of two small filters of equal weight. The cyanide of silver is well-edulcorated, dried carefully, and the weight taken with the filter, the other serving as counterpoise; the weight thus obtained is multiplied by two in order to obtain the amount of prussic acid contained in the water; it is corrected by adding some of the second product, so that each ounce shall afford 5 grs. of cyanide of silver, and is again tested; if any be found wanting, it is made up by the addition of officinal prussic acid.

To make this preparation *ex tempore*, Hænle mixes 12 oz. of distilled water,  $\frac{1}{2}$  a drachm of essential oil of bitter almonds, and 10 drachms of prussic acid of the *Pharm. badensis*, which is then filtered and preserved.

M. Hænle recommends, for the extemporaneous preparation of cherry-laurel water, mixing 12 oz. of distilled water with  $\frac{1}{2}$  a drachm of oil of the laurel-cherry and 6 drachms of prussic acid, prepared according to the Baden Pharmacopœia. This water contains three-fifths of a grain of anhydrous prussic acid to the ounce, and affords 3 grains of cyanide of silver.—*Jahrb. für Prakt. Pharm.*, vi. p. 311.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On Sugar, its Manufacture and Refinement.*

By CARL HOCHSTETTER.

THE present memoir may properly be divided into two parts; the one which we now present to our readers contains the theoretical portion, which will be followed in a subsequent Number by the practical results in reference to the manufacture and refinement of sugar, but especially of that derived from the beet-root.

1. *Influence of the Atmosphere on Solutions of pure Sugar at the ordinary Temperature.*—Sugar dissolved in distilled water may be preserved for weeks in closed vessels without undergoing the least change; but if a solution indicating about 10° Beaumé be exposed to the air in a glass protected from dust, it will be found to contain after three days traces of altered sugar, which gradually increase.



When a glass cylinder, open at both ends, was filled with fragments of glass in the manner of an acidifying vessel used in the preparation of vinegar according to the quick method, and a pure solution of sugar of 10° Beaumé was allowed to trickle over the fragments of glass at a temperature of 66°, the air having free access, and the liquid which passed through being again returned, traces of modified sugar were observed after the experiment had been carried on for six hours, for on the addition of sulphate of copper and potash, protoxide of copper separated. This alteration progressed rapidly, and decomposition had advanced so far in thirty-six hours, that on evaporation under the air-pump at first none, and only after several experiments was a small crop of crystals obtained. The liquid in this experiment had remained colourless, but it had become somewhat turbid.

2. *Influence of Heat on pure Solutions of Sugar.*—A solution of pure sugar, boiled for some length of time, or exposed to a temperature above the boiling point of water, is decomposed; it loses its property of crystallizing. Several new products originate; non-crystalline sugar, called by some syrup-sugar, and characterized as a peculiar kind; further, formic and acetic acids, ulmine, ulmic acid, and other substances not yet examined.

These changes and metamorphoses under the influence of water and heat take place very slowly. To detect distinctly the change which a solution of sugar has undergone in boiling, the action must be continued several hours. Numerous experiments have led the author to doubt the correctness of the view generally adopted, that the greater portion of the molasses obtained in the manufacture of sugar is sugar destroyed by heat.

A solution of pure sugar of 25° Beaumé was boiled in an open dish in one experiment for an hour, in another for an hour and a half, and in a third for two hours, the evaporated water being each time restored when the temperature of the boiling mass had risen to 230° to 234° Fahr. Even after two hours' boiling in this manner the mass had not at all become coloured; it afforded an abundant crop of crystals under the air-pump, and the liquid portion separated from the crystals formed after some time a dry mass. Nevertheless decomposition had taken place, for the test with copper indicated traces of non-crystalline sugar, and the liquid, when heated with lime-water, was coloured yellowish. This experiment, frequently repeated, always gave the same result. When the boiling is effected in a flask, it is altered in the same time more than in the dish. This probably arises from the condensed water, which flows back, containing traces of formic acid that cannot be detected by reagents, but which further the decomposition of the sugar. It may very easily be observed, on boiling solutions of sugar for some time, that the decomposition of the sugar advances more rapidly the longer the action is continued.

The author never found a solution of sugar which had been boiled a very long time in an open dish to act acid on blue litmus paper; nevertheless the liquid contains acid products, which on the



addition of alkalies instantly destroy their alkaline reaction. Partially insoluble compounds are formed on the addition of lime. The formation of volatile and non-volatile acid products is incontrovertible; it hence directly results that fruit and grape-sugar are formed as in the action of acids on cane-sugar. M. Ventzke supposes that a peculiar kind of sugar is formed by the decomposition of the cane-sugar on boiling, to which he applies the name of syrup-sugar, and characterizes it by its property of not polarizing light; but this is somewhat hazarded, for if we compare the phenomena which accompany the changes which sugar undergoes on boiling with the action of dilute acids, great analogy will be evident, since in both cases acid products originate. It must also be assumed, that as soon as acid products have originated in the boiling solution of sugar, they act so as to form fruit and grape-sugar, along with other products. The perfect neutrality of the sample of sugar examined by Ventzke may therefore have resulted from fruit and grape-sugar being present in such proportion as to neutralize each other by their opposite powers of polarization. A separation or isolation of these two sugars is as yet impossible; they can scarcely be separated by crystallization.

In order to observe the influence of the atmosphere on boiling solutions of sugar, a solution of 15° Beaumé was boiled in a flask, and a current of atmospheric air drawn uninterruptedly through the boiling liquid by means of an aspirator. The influence of the air was very decided, for in less than an hour and a half the saccharine liquid had become perceptibly coloured; the test with copper indicated a very considerable decomposition, and the sugar crystallized under the air-pump with greater difficulty, leaving behind a highly-coloured syrup, than in the experiments in which the boiling solution was not so much exposed to the air, for on boiling in the open dish the disengagement of vapour prevents the access of the air.

3. *Influence of Alkalies on Solutions of Sugar.*—It is well known that cane-sugar forms compounds with the alkalies, and that it may again be separated from them by acids unaltered. The combination with lime is particularly important in the refining of sugar. Although it has been frequently proved that the lime behaves towards sugar precisely in the same manner as the other alkalies, yet refiners are generally of opinion that large additions of lime to the saccharine juices of the plant destroy the sugar. To settle this point, and also to obtain a knowledge of the behaviour of an alkaline solution of sugar under various influences, the following experiments were made:—

Some sugar-lime was prepared by digesting solution of sugar with caustic lime in excess at the ordinary temperature; after filtration, a clear transparent liquid, saturated with lime, was obtained, which was employed in all the following experiments.

When this solution was decomposed by carbonic acid, heated to boiling to expel the excess of carbonic acid, and the liquid then separated by filtration from the deposited carbonate of lime, perfectly pure sugar was obtained upon evaporation under the air-pump,



which when dissolved exhibited with the copper test not a trace of decomposition.

Another portion of this solution of sugar-lime was boiled for two continuous hours over a naked fire, the water which evaporated being constantly replaced; when decomposed with carbonic acid, the sugar behaved as in the preceding experiment.

A portion of the solution was evaporated in a porcelain dish at a boiling temperature, which was even increased to  $248^{\circ}$  Fahr. As the mass became at this point so thick that it could not be stirred, a portion got burnt, and indicated by the smell the formation of the products of decomposition which sugar affords when submitted with alkalies to dry distillation. After cooling, the entire mass was so hard that it might be easily reduced to a powder. The white pieces were separated from those which had become brown owing to the above cause; the former dissolved without residue in water, and afforded not a trace of non-crystalline sugar when decomposed with carbonic acid.

When a concentrated solution of sugar-lime is exposed for some length of time to the atmosphere, the sugar may likewise be separated unchanged, but in this case a very peculiar phænomenon occurs; the mass gradually attracts carbonic acid from the air, without however carbonate of lime being precipitated, becomes at last gelatinous, and dries under the air-pump to a gummy transparent mass. On dissolving this in water large quantities of carbonate of lime separate; which also occurs when the moist gelatinous mass is diluted with water.

On attempting to dissolve freshly-precipitated carbonate of lime in concentrated or dilute solutions of sugar or sugar-lime, only traces were taken up. When carbonic acid is passed into solution of sugar-lime, a precipitate of carbonate of lime is immediately formed. Concentrated or dilute solutions which have been exposed for a long time to the atmosphere, generally become somewhat coloured, but never could a trace of decomposed sugar be detected.

4. *Influence of neutral Salts on Solutions of pure Sugar.*—The alkaline chlorides, neutral sulphates, carbonates of the alkalies, but especially the chlorides, prevent the crystallization of cane-sugar; it appears as if they actually enter into combination with the sugar. Peligot has described a crystallized combination of common salt and cane-sugar, but other chemists have not been able to obtain it. Mitscherlich admits no such combination. The author has not endeavoured to prepare it, but has confined himself to ascertaining to what extent these salts prevent the crystallization of the sugar.

A solution of sugar, to which he added 2 per cent. of common salt, and in another experiment just as much chloride of calcium, could not be made to crystallize. The mass, dissolved in water, and treated in the cold with a rather large quantity of bone-black, again crystallizes, but it then contains only traces of these salts. The carbonate alkalies behave in a similar manner.

Nitrates and sulphates crystallize partially from a solution of sugar to which they have been added in large quantity; a portion



however forms with the sugar a smeary mass; in very small quantities, up to 2 per cent., they prevent the crystallization of the sugar, but not in the same degree as the chlorides.

5. *Influence of Nitrogenous Bodies on pure Solutions of Sugar.*—According to the present state of our knowledge, the presence of nitrogenous bodies is absolutely necessary in order to set solutions of sugar in fermentation, whether it be the vinous, acid or mucous. No vegetable saccharine juice is free from this condition, for all are capable, under certain circumstances, of running into fermentation.

H. Rose has shown, that in the action of ferments the cane-sugar is converted into grape-sugar previous to the commencement of vinous fermentation; it is very probable that not only the vinous fermentation, but also the other similar metamorphoses of cane-sugar, are preceded by a transition into some other direct fermentative sugar. The conditions under which fermentation takes place, are a temperature from above freezing point to about 122° Fahr., and access of atmospheric air to the bodies acting on each other. The conditions under which nitrogenous bodies determine the vinous, lactic, or mucous fermentation, have not yet been ascertained.

In the beet-root, vegetable albumen and a series of other nitrogenous bodies are present; but it has never been shown whether the latter belong to the proteiniferous compounds, and whether they are suited to effect such changes; but it is a well-known fact, that the juice of the cane, as well as that of the beet-root, possesses the property of fermenting. Is the metamorphosis induced by the so-called albumen alone?

Let us first consider the phenomena presented by the juice of the beet-root. When the sap just expressed is exposed to the atmosphere, it frequently becomes very soon slimy; it undergoes the so-called mucous fermentation as well as the vinous. If juice thus modified be examined, it will be found to contain lactic acid, mannite, a gummy substance, and non-crystalline sugar. Beet-root juice may be preserved for twelve hours and more without undergoing any change, but when once the process of decomposition has commenced it alters very rapidly; the smallest trace of juice in the act of fermentation added to fresh juice induces the change in a few hours. Beet-root juice, from which a great portion of its nitrogenous substances has been removed by boiling and the addition of lime, exhibits nearly the same properties as fresh juice; it undergoes, by exposure to the air, mucous fermentation, whether it contain much or little free alkali. If the alkalinity be neutralized with acids, vinous fermentation frequently ensues, but not always. If however coarsely-pounded ivory-black be moistened with such juice, even though it be alkaline, and the mass be pressed into a glass which is exposed to a favourable temperature, vinous fermentation very soon results, but never any other.

M. Hochstetter endeavoured to produce and observe these phenomena on a small scale, with the assistance of the two nitrogenous substances which he obtained from the precipitates produced by lime in the juice of the beet-root. On adding the gelatinous sub-



stance to solutions of sugar, the liquid generally became in a few days faintly acid and somewhat slimy. Lactic acid had formed, and a gummy substance, which was precipitated by alcohol; the author could never detect mannite in these experiments. The substance insoluble in water, the albumen of the beet-root, brought into contact with solutions of sugar, gave rise to similar changes, but required longer time. The products were the same. A proportion of the previously insoluble albumen had become soluble, and could be precipitated with tannine. When the solution of sugar was rendered slightly alkaline, and then brought into contact with these substances, the alkalinity soon disappeared, and the same decomposition resulted as above. When the solution was rendered very strongly alkaline with a solution of sugar-lime, no change could be observed for a very long time, but it finally took place.

In all these cases the author observed that the cane-sugar was previously converted into another kind of sugar before any appearance of fermentation. This change was very perceptible when a solution of sugar of 10° Beaumé, to which some of the gelatinous substance had been added, was brought into intimate contact with the air by means of a cylinder filled with fragments of glass, in the manner already described. The whole of the cane-sugar appeared to be converted in a few hours into a different kind, without the formation of other products being perceptible. When this process was continued sufficiently long, the liquid became slimy but not acid; in this case the nitrogenous bodies appeared to act as in the formation of vinegar from alcohol.

Acids, especially the mineral acids, prevent the fermentation under the circumstances mentioned. A solution of sugar mixed with nitrogenous substances does not lose the property of running into fermentation by long boiling. Beet-root juice, which had been evaporated to 25° Beaumé, had therefore been exposed for some length of time to the action of heat, changed entirely when placed aside for some time in a flask; carbonic acid was disengaged, which drove the cork out of the bottle; after fourteen days the fermentation ceased, and on examination it was found that neither alcohol nor acids of any kind had formed; the product consisted for the greater part of mannite and a gummy mass, which could be precipitated from the aqueous solution by alcohol.

When bad colonial sugar was dissolved in water, and left to itself at a favourable temperature, it presented an appearance similar to that just described, only that no mannite could be detected in such solutions, without doubt because they contained too much of another sugar which prevented its separation.

Influences of a different kind from those just described are exerted by the nitrogenous substances at higher temperatures, *i. e.* in contact with boiling solutions of sugar, or at temperatures only a little above the boiling point of water. It is a well-known fact, that when a concentrated solution of crude sugar and of the best refined sugar are kept for some time at a temperature of about 230°, the first undergoes much more change than the latter.



This view is still more favoured by the following experiments:— Take a raw solution of sugar, and a sample of the same sugar refined by clarifying with blood, and boil both the same length of time ; it will be found that the clarified sugar is very soon coloured, while the solution of raw sugar has remained colourless. Nitrogenous substances exist in every claries of the refiner, even when the purest sugar has been taken for the purpose, which are partly precipitated by tannine, partly not. It is possible that, on employing perfectly fresh blood, the claries is free from these substances. It would be desirable to ascertain this by experiment, for it is certain that the older and the more spoiled the blood is, *i. e.* the more albumen it contains, or the more it has been altered by putrefaction, the greater is the amount of nitrogenous substance in the claries. But it is not improbable that the albumen of the blood is partially so modified by the action of heat in the process of clarifying, that it is no longer coagulated, or, once coagulated, again dissolves.

The same result was obtained when the above-mentioned gelatinous substance was added to a pure solution of sugar and boiled. The solution became coloured, and the copper test indicated the formation of another kind of sugar. In this case the nitrogenous substance may be shown to have changed by experiment, for when ebullition has been continued for some time, lime-water produces scarcely any precipitate, while nitrate of mercury throws down a very voluminous one : previous to the boiling the substance could be thrown down entirely by lime.

The products which are formed by this decomposition of the nitrogenous substances were not further examined. It is probable that in this change ammonia is formed and escapes, while the other elements unite to form acid products, which then produce the same changes in the sugar as all acid bodies ; the brown colouring of the molasses arises principally from these products of decomposition.

[To be continued.]

### *Examination of Black Cloth.*

Moisten a cork with a dilute solution of oxalic acid, and press it on the cloth. If the ground colour be indigo, a greenish-olive-coloured spot will appear ; but if the cloth was coloured black merely with vitriol and logwood, the spot will be of a dark orange-yellow.—*Mittheil. d. Gewerbevereins zu Braunschweig.*

## REVIEWS.

*A Series of Tables of the Elementary and Compound Bodies, systematically arranged and adapted as Tables of Equivalents, or as Chemical Labels. By CHARLES BUTTON and WARREN DE LA RUE. Part I.*

THESE tables are to afford the student an easy means of acquiring a knowledge of chemical notation, for which purpose each label



contains, beside the name of the body or compound, their symbols and equivalents as adopted by Liebig and Gregory in their last edition of 'Turner's Elements,' and also those of Berzelius and Brande. The authors also intend the work to serve the purpose of a Table of Equivalents, and we therefore find labels for bodies which few chemists are in the habit of preserving in bottles, such as oxygen, hydrogen, and above all fluorine; we likewise have labels for a set of hypothetical bodies, such as amide, ammonium, &c., which might have been dispensed with; as might also those for such bodies as thorium, didymium, lanthanum (not lantanum), and their compounds, and numerous others, which few chemists possess, and certainly not in quantities which would require a 2-oz. bottle for their preservation. As labels, we are exceedingly well-pleased with them, with the above exception; but as a *Table of Equivalents*, we object to the form as being very inconvenient; in fact the two cannot be combined, for if the work is cut up for labels, it is rendered imperfect as a Table of Equivalents. We must however, in justice to the authors, state that they have been got up with the greatest care and accuracy, and that neither pains nor expense have been spared to render them beautiful.

## PATENTS.

*Patent granted to James Hancock, Walworth, for a Method of forming a Fabric or Fabrics, applicable to various Uses, by combining Caoutchouc with Wood, Whalebone, or other fibrous Materials.*

THE fabrics produced by this invention are suitable for sheathing ships, covering the roofs of houses and other buildings, and for various other purposes. They are made by weaving or plating wire, strips of wood, whalebone cane, or other suitable substances, so as to form a base, on each side of which a sheet of cloth, caoutchouc, or other material, is secured by means of a solution of caoutchouc.

When the fabric is to be used for sheathing ships, its base is formed of thin strips of whalebone, one-fourth of an inch wide, from one-fortieth to one-thirtieth of an inch thick, and of the same length as the sheathing is required to be, that is, about thirty-four inches; and these strips are platted, crossed, or woven together, in such a manner as to leave open spaces of from one-fourth to one-half of an inch between the strips. Instead of the whalebone, thin strips of metal or wire, either flat or round, may be used; or the strips of whalebone and metal and the wire may be platted together alternately. The base thus formed is placed between two sheets of felted cloth of the required size, and the whole is saturated with the compound solution of caoutchouc hereinafter described.

The method of saturating the fabric with the solution of



caoutchouc is as follows:—The solution is contained in a metal trough or pan, heated by a steam-bath, and at one end of it is a roller on which the fabric is wound; from this roller the fabric passes between a pair of rollers immersed in the solution, and then between another pair mounted in bearings above the trough, for the purpose of removing the superfluous portion of the solution; it is thence conducted over another roller at the other end of the trough, and between a third pair of rollers, which exert a greater pressure upon it than the rollers before mentioned; after this it is cut to the required size, and the edges are beveled by means of a knife or other instrument.

In order to make the solution above referred to, a quantity of caoutchouc is dissolved in coal-tar oil, or oil of turpentine, and passed through an iron strainer; equal quantities of pitch and Archangel or Stockholm tar are then mixed together, and after being heated by a steam-bath the dissolved caoutchouc is added to them in the proportion of 11 parts of caoutchouc to 1 of the pitch and tar mixture.

For covering roofs, the base of the fabric is made by weaving or platting together shavings of wood, from one-thirtieth to one-twelfth of an inch in thickness, which is then placed between two pieces of felted cloth, as before described; or the base may be made by platting together strips of whalebone or cane. The fabric is then subjected to pressure by passing it between a pair of heated cylinders or rollers, and when dry it is cut to the required size.

A fabric, which may be used as a substitute for leather, is produced by platting or weaving strips of cane, whalebone or wood, separately or together, alternately, and placing the base thus formed between two pieces of scale-board, the surfaces of which have been covered with the caoutchouc solution. The fabric is then passed between a pair of rollers, and when dry is ready for use.

By weaving together strips of wood and coarse thread a fabric for hat bodies is formed; the strips of wood constituting the weft, and the coarse thread the warp, or *vice versâ*.

In some cases the patentee covers the bases of whalebone, wood, or other materials, with silk, muslin, paper, woven cloth, or sheet caoutchouc, first coating the surfaces with the caoutchouc solution, and then subjecting the fabric to pressure.

Another fabric is produced by using wire, woven in the usual manner, as an intermediate substance, and covering it on both sides with cloth, or other material, prepared as hereinbefore mentioned. These fabrics are applicable, amongst other purposes, for forming military caps, scabbards and cartouch-boxes, panels and roofs for coaches, and tilts for carts, vans, and other vehicles.—Sealed Feb. 8, 1840.



# THE CHEMICAL GAZETTE.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On Chemical Phænomena due to Contact.*

*By J. REISET and E. MILLON.*

FOR some years the attention of chemists has been drawn to a class of phænomena which appear to be independent of the ordinary laws of chemistry. They consist of combinations and decompositions, which are determined by the presence of certain bodies without its being possible to attribute these chemical actions to affinity. They have generally been classed under the denomination of contact phænomena, and M. Berzelius has assigned the name "catalytic" to the still unknown force to which they owe their origin.

MM. Reiset and Millon have recently made known a large number of remarkable facts belonging to the same class. The following is an abstract of their communication.

If into a suitably-arranged apparatus oxygen is conveyed on to an intimate mixture of platinum black and organic substance, veritable combustions take place at very low temperatures. Tartaric acid already affords water and carbonic acid at  $320^{\circ}$  Fahr.; the combustion is nearly perfect below  $482^{\circ}$ . Racemic acid behaves in a similar manner. Cane, grape, milk and diabetes sugar give off carbonic acid and water at from  $284^{\circ}$  to  $300^{\circ}$ ; the combustion is nearly complete at  $482^{\circ}$ . Butter even affords carbonic acid at from  $90^{\circ}$  to  $212^{\circ}$  Fahr.; olive oil between  $176^{\circ}$  and  $194^{\circ}$ ; stearic acid and wax burn at about  $212^{\circ}$ ; their combustion is perfect below  $392^{\circ}$ .

In all these examples the platinum effects phænomena of combination, but it determines with the same energy phænomena the very opposite. It separates as well as combines; it destroys the molecular arrangement; it operates like heat, and sometimes affords the same products; sometimes it produces peculiar combinations.

The nitrate of silver, mixed with oil or with from 8 to 10 times its weight of platinum-black, is entirely decomposed at a temperature at which the same salt in a pure and unmixed state undergoes no alteration. The chlorate of potash behaves in the same manner in the presence of platinum-black.



But platinum is not the only body which is able to determine these decompositions; pumice-stone and charcoal possess the same property, but in different degrees. Pumice-stone behaves like platinum towards chlorate of potash.

Nitrate of ammonia alone decomposes at  $230^{\circ}$  into water and protoxide of nitrogen. In contact with pumice-stone it is destroyed at the same temperature, giving water and a mixture of nitrogen and of protoxide, in which the latter predominates. It is decomposed in presence of platinum already at  $160^{\circ}$ , but it then forms products entirely different, for instance water, nitric acid and nitrogen. Lastly, charcoal produces the separation of the elements of the nitrate of ammonia at  $170^{\circ}$ , but the disengagement of the gases takes place with such violence that the tube breaks with explosion.

The pyrogenous decomposition of organic substances is modified in a manner equally interesting. Tartaric acid, submitted solely to distillation, becomes black, carbonifies, and disengages, along with tarry and empyreumatic products, a mixture of several gases. In presence of platina the products are limpid, colourless and crystalline; the gas which is liberated is pure carbonic acid.

The decomposition of racemic acid, and that of citric acid, present analogous modifications, according to whether the acids are heated alone or in the presence of platinum or of pumice-stone. Even in these two cases the pumice-stone exhibits a more energetic action than the platinum; it does not require so high a temperature for the decomposition to be effected, and changes more completely the nature of the products.

Oxalic acid resists the influence of platinum-black and pumice-stone; the same gases are obtained in the same proportions in the presence of these substances as by the action of heat alone. But it is very remarkable that the contact of pulverized charcoal causes the greatest perturbation in the mode of its decomposition.

Thus platinum-black, pumice-stone and charcoal constitute three agents of contact perfectly distinct; they do not possess an absolute activity, but they act in various degrees on the same substance. Some are active towards certain substances, the others inert.

It must be observed that the change effected in the nature of the compound does not depend solely on the temperature. Thus acetic acid may be distilled without alteration over pumice-stone, while it is entirely decomposed by platinum-black. If the temperature is raised so as to produce decomposition with the pumice-stone, the gases obtained in the two cases are totally different.—*Bibliothèque Univers. de Genève.*

*On the Chemical Constitution of the Gallates and Tannates of Iron, and on Dyes having Iron for Base. By M. BARRESWILL.*

When a solution of gallic or of tannic acids, which are colourless, and generally form colourless salts or of the colour of the bases, is poured into a solution of the persulphate of iron, an intense blue



precipitate is formed, which remains suspended in the liquid. This anomalous fact has frequently excited the attention of chemists, MM. Berzelius and Chevreul have even expressed some doubts respecting the simplicity of the reaction.

It has long been known that tannine and gallic acid do not precipitate the protosalts of iron when protected from contact with the atmosphere. Berzelius, Chevreul and Persoz have moreover observed that when gallic acid or tannine is conveyed into a salt of the peroxide of iron, it is always reduced to the state of a protosalt. This fact is easily proved by adding to the blue solution produced by the persulphate of iron in a solution of gallic acid, an excess of acetate of lead or of carbonate of lime, which precipitates the blue combination, and at the same time the sulphuric acid. A colourless liquid is separated by filtration, in which the presence of iron may be demonstrated in the state of protoxide.

These experiments are insufficient to explain this curious reaction. It is not improbable to admit, as MM. Berzelius and Chevreul have done *à priori*, that the oxygen combining with the gallic acid or the tannine converts them into a new acid of a blue colour; but positive experiments were wanting to decide the point.

When a solution of tannine or of gallic acid is poured by drops into a solution of persulphate of iron in excess, no blue colouring is obtained; if there is one produced it is only momentary. Nor is there one formed with the same salt in minimum in presence of chlorine, nor with a protosalt of iron and gallic acid oxidized in various degrees by chlorine, by a salt of silver, or lastly, by the atmosphere in an alkaline solution.

When a solution of gallic acid in excess is conveyed into persulphate of iron, and the liquid thrown down by acetate of lead, a blue paste is obtained, which treated with oxalic acid forms soluble oxalate of iron; the blue colour disappears entirely, and is restored by acetate of soda. The solution of the oxalate, diluted very much with water, treated cautiously with the two prussiates and sulphuretted hydrogen, presents all the characters of the salts of iron in the state of peroxide and protoxide.

It appears to me that we may conclude from the above facts, that if we start with a protosalt of iron, it is requisite to add oxygen, and if we set out with a persalt, some oxygen must be removed, in order to produce the blue compound, and that this compound contains the two oxides. In the first case the protoxide of iron combines with the oxygen of the atmosphere; in the second, a portion of the oxygen of the peroxide destroys a corresponding portion of the gallic acid or of the tannine, converting it into a brown substance. This substance does not enter into the constitution of the new compound, which must be considered as a salt formed of tannine or gallic acid and of an intermediate oxide of iron, probably of a blue colour, the tint of which is slightly altered by this brown substance.

To prove in the most evident manner that the blue colouring is not to be ascribed to a blue acid, but to a particular oxide, I en-



deavoured to obtain other blue salts with mineral acids, for instance with sulphuric acid. For this purpose I prepared some mixtures in variable proportions of the protosulphate of iron and of the persulphate, and to avoid an inevitable separation of the two salts from their different degrees of solubility, I removed *immediately* the water by adding to the solution concentrated sulphuric acid in large excess, taking care to produce as little heat as possible. In this manner I obtained a thick paste of a *deep blue*, the tint of which was more or less pure according to the proportions of the two salts of iron. I likewise produced a blue sulphate, but of very ephemorous existence, by evaporating rapidly a mixture of the two salts of iron; the blue tint appeared at the moment when the mass was nearly dry. On substituting phosphate of soda for the sulphuric acid, I obtained a deep blue phosphate of iron and some sulphate of soda, which removed the water immediately. I endeavoured, but without success, to prepare combinations with other salts; the hyposulphite of soda alone afforded an intense blue colouring, but of remarkable instability. This is not surprising; there are many instances in chemistry of bases which prefer combining with certain acids and refuse to unite with others; such for instance, among others, is the protoxide of copper.

I made numerous experiments to obtain the blue oxide in a free state; I succeeded several times, but under circumstances which I was not able to produce at will. It is however a well-known fact, that when a protosalt of iron is precipitated with ammonia in contact with the atmosphere, the white precipitate of the protoxide soon becomes green, passing first however through blue.

The impossibility of obtaining the blue sulphate of iron in a crystalline state, and of isolating the acid of the blue gallate compound, prevented me from having recourse to analysis in order to arrive at the formula for these intermediate salts: I was forced to proceed by synthesis, which I confess is far from being accurate; and it is with some doubts that I publish the results.

Of all the mixtures of protosulphate and persulphate which I experimented on, that which afforded the most pure blue with sulphuric and gallic acids and with the phosphate of soda, contained precisely 3 equivalents of protosalt to 2 of the persalt—proportions which correspond to the cyanide  $\text{Fe}^7 \text{O}^9$ , prussian blue.

This coincidence of colour between the oxide and cyanide, independent of the experiment, would render the formula very probable, for, curiously enough, it goes through the other analogous compounds. Thus the protoxide and protocyanide are white; the peroxide and percyanide are red. Moreover, M. Pelouze has described an intermediate *green* cyanide, to which he has assigned the formula  $\text{Fe Cy}$ ,  $\text{Fe}^2 \text{Cy}^3$ , and M. Berzelius has described a green arseniate in which the oxygen and iron are in the same proportions,  $\text{FeO}$ ,  $\text{Fe}^2 \text{O}^3$ ; the same is, without doubt, the case with the dark green acetate of iron described by M. Chevreul, the green oxalate of iron, and the green precipitate which alkalies produce in solutions of protosalts of iron in contact with the atmosphere.



I will also call attention, as bearing on this subject, to an experiment of M. Berthier. This chemist having heated some oxide of iron in a crucible, obtained a mass which presented three distinct layers, the first blue, the second green, the third black, proceeding from the circumference to the centre, *i. e.* from the portion the least oxidized to that which was the most.

If, as I hope, I have rendered probable the existence of two intermediate oxides of iron, capable of forming salts and of entering into the salts with their peculiar colour, I shall have thrown some light on the various tints produced by the different kinds of astringent substances, morphine, salicylic acid, and some other organic principles; and likewise on the production of violet, black, brown and green tints, with red and yellow colouring principles, in presence of salts of peroxide of iron. I have convinced myself that all the yellow colouring substances (for instance curcuma) do not produce green; that the red colouring principles (among others aloetic acid) do not give a violet; and that when there is a production of green (as with the Persian berries and the Quercitron), or of violet (as with madder, logwood, &c.), the phenomena are identical with those which occur with tannine and gallic acid. These observations agree moreover perfectly with the suppositions of M. Thenard, with the facts published by M. Köchlin-Schouch, and by M. Schlumberger, and which M. Stackler informs me he has found confirmed in his establishment, that the iron mordants should be at a fixed degree of oxidation to produce beautiful dyes.—*Comptes Rendus*, October 9.

#### *Formation of Butyric Acid.*

MM. Erdmann and Marchand have observed the formation of butyric acid in the fermentation of various kinds of seed under water\*. In this fermentation, in which the atmosphere was not entirely excluded, pure carbonic acid gas was disengaged at the commencement; subsequently carbonic acid and hydrogen in the proportion by volume of 2 : 1. At the end of several weeks the evolution of gas ceased, the liquid had an odour of rancid butter, and disengaged ammonia when treated with potash. The butyric acid is easily isolated by distillation with phosphoric acid, and its identity ascertained by preparing the barytes salt. Maize gave off very little carbonic acid even after two months' standing under water, and afforded scarcely traces of butyric acid.—*Journ. für Prakt. Chem.*

#### *Extraction of Palladium in Brazil.*

The extraction of palladium from the auriferous sand of Brazil consists in fusing it with silver, and consequently forming a quaternary alloy of gold, palladium, silver and copper, which is granulated by projecting it into water.

\* See MM. Pelouze and Gelis' Memoir on the artificial production of butyric acid, pp. 477 and 506 of this Journal.—Ed.



By treating this alloy with nitric acid the gold is separated from the other metals which are soluble in the acid; the silver is precipitated by a solution of common salt in the state of insoluble chloride, which being separated, the copper and palladium are precipitated by plates of zinc. The pulverulent deposit of these metals is redissolved in nitric acid and the solution precipitated by excess of ammonia, which redissolves the oxide of copper and of palladium; when the ammoniacal solution of these metals is saturated with hydrochloric acid, a double chloride of palladium and ammonia is deposited in the state of a crystalline yellow powder, and this when calcined in a crucible is readily decomposed, and leaves spongy palladium.—*Journal de Chémie Médical*, October 1843, and *Philosophical Magazine* for November.

## ANALYTICAL CHEMISTRY.

*On Antimoniate of Potash as a new and excellent Test for Soda.*

By Professor WACKENRODER.

My attention has been directed to this subject by an observation of Fremy's, in his memoir on the metallic acids\*, respecting the property of antimoniate of potash of affording a crystalline insoluble precipitate with solutions of soda salts. As we are still in want of a direct means of precipitating soda whenever this occurs mixed with potash, further investigation as to the behaviour of the antimoniate of potash could only prove of service to analytical chemistry. The difficulty experienced in examining potashes, ashes of plants, and other mixed alkaline salts, is generally felt. I think now however that we may consider this overcome by the application of the antimoniate of potash, which, should it prove suited, as I have not the least doubt it will, for the direct quantitative determination of soda, will be invaluable to the chemist engaged in the analyses of the ashes of plants, which of late have become so important.

Fremy advises preparing the antimoniate of potash by fusing the antimonie acid with an excess of potash. According to him this salt will indicate the presence of  $\frac{1}{350}$  soda. The precipitate of antimoniate of soda is only formed according to Fremy's observation after shaking, and is somewhat soluble in a large excess of carbonate of potash; if therefore strong alkaline solutions be avoided, the antimoniate of potash might be employed for the direct determination of soda.

From this it will be evident that there are still many questions to answer before the antimoniate of potash can be employed with certainty and confidence for the detection and determination of soda salts.

To obtain the antimoniate of potash as neutral as possible, 50 grms. of *Antimon. diaphoret. ablutum*, prepared according to the directions

\* See this Journal, p. 397.



of the Prussian Pharmacopœia \*, were mixed with 20·4 grms. pure carbonate of potash, which proportion corresponds pretty accurately to equal atoms of acid and base, and exposed in a Hessian crucible for half an hour to a strong red heat. When the mass had assumed a crumbling appearance the heating was discontinued, the salt taken from the crucible before it had cooled entirely, and preserved as a coarse powder protected from the atmosphere. This antimoniate of potash has a white colour with a faint bluish tint, probably arising from a slight trace of manganese, which however is of no consequence. It soon becomes moist and pasty when exposed to the air; subsequently however it again dries. It does not effervesce when treated with dilute hydrochloric acid. On digestion with 50 to 100 parts of warm water, it dissolves with separation of some antimonious acid. It should not be filtered before it has become quite cold, in order to avoid repeated filtration. Sometimes a little antimonious acid is deposited after long standing, the reason of which appears to be that the potash takes up more antimonious acid than it can hold in solution in the cold. The clear solution has a strong alkaline reaction; it may be exposed to the air for days without becoming turbid, and even when a current of air was passed through it for five minutes it was not rendered opaque, but after twelve hours deposited a few flakes, probably of bi-antimoniate of potash. The antimonious acid is evidently only slightly and very slowly precipitated by free carbonic acid; the liquid even remains clear when mixed with an equal volume of the ordinary solution of carbonate of ammonia; only after long boiling with it does an inconsiderable precipitation of white flakes result. The solution of the antimoniate of potash diluted 100 times affords, on the contrary, with solution of chloride of ammonium gradually a considerable flocculent precipitate, which probably consists of bi-antimoniate of ammonia. Excess of acids, especially hydrochloric and acetic acids, immediately produces voluminous precipitates, which are neither soluble in water nor in solution of chloride of ammonium, and most likely consist of the hydrated antimonious acid with a small amount of alkali. On the contrary, and what is well worthy of attention, when the solution of the antimoniate of potash has been previously diluted from 200 to 300 times with water, or mixed with a solution of carbonate of ammonia, these acids either give rise to *no* precipitate, or only to a slight one, which gradually forms in the *course of several days*. The conflicting statements which have been made respecting the decomposition of the antimoniate of potash by acids, appear to have arisen from the different degree of dilution of the solution.

The following experiments were made with a solution of the antimoniate of potash in 100 parts of water:—

1. *Salts of Potash*.—Moderately dilute aqueous solutions of chloride of potassium, of nitrate, sulphate and acetate of potash, are *not* rendered turbid by antimoniate of potash when perfectly free from

\* For the method of preparing this, see p. 714 of the present Number.  
—ED.



lime and magnesia. With a very small amount of these earthy bases an opalescence ensues, and subsequently a slight flocculent precipitate, the antimoniate of potash being a very sensitive test for the salts of the alkaline earths. This slight opacity does not arise from precipitated antimonious acid, as the test is not easily decomposed by the carbonic acid of the atmosphere.

On this occasion I also found that the sulphate of potash of commerce is not only frequently impurified with lime, but likewise to a considerable extent with magnesia. A turbidness was produced immediately on the addition of the antimoniate of potash, and after standing for a few hours an abundant crop of crystals had separated, which proved to be antimoniate of magnesia.

Concentrated and dilute solutions of carbonate of potash are not rendered opaque by the antimoniate of potash; but if they contain the least trace of lime, which is usually the case with *Sal. tartari*, they opalesce, and on standing deposit a slight flocculent precipitate. A solution of carbonate of potash in 100 parts of water may be mixed with an equally dilute solution of antimoniate of potash in the proportion of from 1 : 1 to 1 : 6 without any opakeness resulting, even after long standing.

2. *Salts of Soda*.—The salts of soda afford very readily with antimoniate of potash a characteristic precipitate of antimoniate of soda; it is always *crystalline*, and under the microscope appears in the form of simple or twin crystals.

The primitive form of these crystals is a *cubic prism*. The *single* crystals are cubic *prisms* with truncated ends, forming therefore a transition to the quadratoctahedron, which is one of the most seldom primitive forms, and occurs only in sixteen or twenty minerals, as zircon, gehlenite, wernerite, thomsonite, harmotome and apophyllite; braunite, hausmannite and copper pyrites; pyramidal tin-ore, uranite, anatase, rutile, Scheelite, tungstate of lead, molybdate of lead, and muriate of lead. It is curious that half of these minerals likewise contain a mineral acid. The antimoniate of soda is therefore remarkable from, and easily distinguished by, its form of crystallization.

With a great excess of antimoniate of potash and suitable dilution, the antimoniate of soda separates in four-sided prisms, sometimes from half to one line in length, sometimes in long octahedrons in radiant or fascicular groups.

*a.* When a solution of the antimoniate of potash, diluted 100 times, is added to a solution of pure crystallized carbonate of soda in 100 parts of water, without agitating the liquid, small prisms of a vitreous lustre are deposited; but if the liquid be shaken, a voluminous precipitate, of a more flocculent nature, is immediately formed. The solution of the carbonate of soda may be diluted as much again, and yet a considerable opalescence, and after a time a crystalline deposit is produced on the addition of the antimoniate of potash. Even with a dilution of 500 times there is still a perceptible opalescence.

*b.* When ordinary solutions of chloride of sodium, sulphate of



soda, phosphate, nitrate, carbonate and acetate of soda, are mixed with about a quarter of their volume of the antimoniate of potash, in which therefore the soluble salts of soda are always in excess, there is immediately formed a considerable crystalline precipitate on agitating the liquid.

c. When mixtures of potash and soda salts are treated with antimoniate of potash, the soda is nevertheless precipitated, and apparently to the same extent as with pure soda. But a *considerable excess* of the *carbonate of potash* prevents entirely the formation of the antimoniate of soda. The precipitated antimoniate of soda is likewise dissolved by carbonate of potash; in testing purified pearl-ash for soda, it is therefore requisite to saturate the carbonate of potash first with hydrochloric or acetic acid. When solutions, all of which have been made with 100 parts water, of 1 part carbonate of soda, 1 part carbonate of potash, and 2 parts antimoniate of potash, are mixed together, an opalescence results immediately, but no precipitate. On being left undisturbed for some time, the mixture however deposits numerous distinct crystals of antimoniate of soda.

In a liquid consisting of 1 part carbonate of soda, 20 parts carbonate of potash, and 10 parts of antimoniate of potash, in which therefore the state of dilution amounted to 3000 times, a distinct crystalline deposit resulted after being left to stand for some time. The usefulness of antimoniate of potash as a test for soda is placed beyond doubt by these experiments.—*Archiv der Pharm.* for July.

## PHARMACOLOGY.

### *Observations on Cod Liver Oil.* By M. JONGH.

THE author distinguishes three different kinds according to their colour:—

*Brown Liver Oil.*—Colour dark brown, with transmitted light greenish, transparent in thin layers; odour disagreeable, empyreumatic; taste bitter, empyreumatic, strongly irritating the throat; it has a slight acid reaction; its specific gravity is 0.929 at 76° F. Cold alcohol of 0.968 spec. grav. dissolves from 5.9 to 6.5 per cent. boiling alcohol of the same strength, from 6.5 to 6.9 per cent. It is soluble in every proportion in æther.

*Bright brown Liver Oil.*—In colour resembling Malaga wine; odour not disagreeable; taste fishy, bitter, irritating somewhat the throat; reaction slightly acid; specific gravity 0.924 at 64° F. Cold alcohol dissolves from 2.8 to 3.2 per cent., hot alcohol from 6.5 to 6.8; soluble in every proportion in æther.

*Bright Liver Oil.*—Of a gold yellow colour; odour not disagreeable; taste fishy but not bitter, somewhat irritating; it has a faintly acid reaction, a specific gravity of 0.923 at 64° F. Cold alcohol dissolves from 2.5 to 2.7 per cent., hot alcohol from 3.5 to 4.5; in æther unlimited.

The author has made very careful analysis of all three kinds, and



has found that the principal mass of the oil consists of the oleate and margarate of glycerine with their ordinary properties, but containing dissolved in them some free butyric acid and acetic acid; further, the principal constituents of the bile (bilifellinic acid, bilifulvine, cholinic acid), some peculiar substances (among others one which the author calls *gaduine*), and not quite one per cent. of salts, among which were always found combinations of iodine, chlorine and traces of bromine. The oil constantly contains free phosphorus. The amount of iodine was found to be largest in the bright brown kinds. In the following tables we have arranged the quantitative results obtained from all three kinds:—

	Brown.	Bright brown.	Bright.
Oleic acid (with gaduine and two } other substances . . . . . }	69·78500	71·75700	74·03300
Margaric acid . . . . .	16·44500	15·42100	11·75700
Glycerine . . . . .	9·71100	9·07300	10·17700
Butyric acid . . . . .	0·15875		0·07436
Acetic acid . . . . .	0·12506		0·04571
Fellinic acid and cholinic acid, } with some margarine, oleine, } and bilifulvine . . . . . }	0·29900	0·06200	0·04300
Bilifulvine, bilifellinic acid, and } two peculiar substances . . . . . }	0·87600	0·44500	0·26800
A peculiar substance, soluble in } alcohol of 0·968 spec. grav. . . }	0·03800	0·01300	0·00600
A peculiar substance, insoluble } in water, alcohol and æther . . }	0·00500	0·00200	0·00100
Iodine . . . . .	0·02950	0·04060	0·03740
Chlorine and traces of bromine . .	0·08400	0·15880	0·14880
Phosphoric acid . . . . .	0·05365	0·07890	0·09135
Sulphuric acid . . . . .	0·01010	0·08595	0·07100
Phosphorus . . . . .	0·00754	0·01136	0·02125
Lime . . . . .	0·08170	0·16780	0·15150
Magnesia . . . . .	0·00380	0·01230	0·00886
Soda . . . . .	0·01790	0·06810	0·05540
Iron . . . . .	Traces.		
Loss . . . . .	2·56900	2·60319	3·00943
	100·00000	100·00000	100·00000

In the brown kind therefore, margaric acid, the constituents of the bile, butyric acid and oleic acid, and also the peculiar substances predominate, while the bright sort is precisely the poorest in these bodies, but is richest in oleic acid and glycerine, and is somewhat poorer in inorganic salts than the bright brown kind, in which they are, as it were, concentrated. This is entirely what we should expect from the mode of preparing the various kinds.

With respect to the amount of iodine, the author confirms the fact that the iodine can only be discovered by saponifying the oil with potash, and carbonifying the soap; it may then be detected in every real oil. He confirms the observations of M. Stein, that the



iodine cannot be detected either by carbonifying the oil, or by saponification, decomposition of the soap with acids, and examination of the liquids separated from the fat acids, as in the latter case it remains with the fat acids. The iodine therefore is not contained in the oil either free or in the state of an iodide; probably it constitutes an iodiferous fat acid. The author determined the quantity of iodine in the state of iodide of palladium. A weighed amount of the oil was saponified with potash, carbonified in a closed crucible, the ignited coal extracted with alcohol, the alcoholic extract evaporated, the residue dissolved in water, carefully neutralized with dilute sulphuric acid, the precipitate filtered,edulcorated, and dried at  $212^{\circ}$ . 100 parts of the anhydrous iodide of palladium correspond to 70.34 iodine. The presence of bromine was ascertained according to Ballard's method, by treating the alcoholic extract of the carbonified soap with chlorine gas and æther; its quantity, being too small for accurate separation, was determined along with the chlorine. The chlorine was precipitated from the aqueous extract of the carbonified soap as chloride of silver.

Phosphoric acid and sulphuric acid were determined from the potash-soap of the oil in the following manner:—The soap was decomposed by boiling muriatic acid, the separated fat acids boiled several times with muriatic acid, the phosphoric acid then precipitated from the liquid by a solution of nitrate of iron, in which the amount of oxide was known, and ammonia; upon this the sulphuric acid was thrown down by nitrate of barytes.

To determine any phosphorus and sulphur that might be present, weighed quantities of the oil were cautiously oxidized with concentrated nitric acid, and the phosphoric and sulphuric acids determined as above. It was found that only of phosphoric acid was more obtained than previous to oxidation; the phosphorus was calculated from this surplus.

When cod liver oil is shaken with cold water, an emulsion is obtained, from which the oil separates very slowly; the aqueous liquid beneath the oil is obtained clear by repeated filtration; it is coloured and empyreumatic from the brown oil, nearly colourless from the other kinds, and has always a slightly acid reaction. The oil thus treated has a fainter smell, but still reacts slightly acid. Perfectly similar results are obtained by boiling with water; the aqueous solutions are not more concentrated. On evaporation of the aqueous liquids, reddish-brown extracts are obtained from all three kinds of oil, which become soft when warmed, are little soluble in water, more in æther, and nearly entirely in alcohol; they also dissolve in dilute solution of caustic potash, from which they are again precipitated by acids in reddish-brown flakes. They have a peculiar odour and a bitter taste. The quantity of the aqueous extract was from the

	With cold water.	With hot water.
Brown oil . . . . .	1.288 per cent.	1.256 per cent.
Bright brown oil . . . . .	0.890    ...	0.849    ...
Bright oil . . . . .	0.607    ...	0.513    ...



On treating these extracts successively with æther, absolute alcohol, and alcohol of 0.968 spec. grav., they all afforded the same results. Æther gives a reddish-brown, transparent, viscid extract, which deliquesces in the warmth, produces a stain on paper, smells and tastes of bile, and in which, after some time, some small crystals make their appearance. It is slightly soluble in water, easily in alcohol and æther. If it be dissolved in æther, and a solution of carbonate of ammonia added to it, the liquid separates into two layers, of which the upper one affords on evaporation drops of oleine and some small crystals of margarine, and a brown mass, which is identical with that obtained on the evaporation of the inferior layer. This brown mass, which has a very bitter taste, may be separated by water into a soluble and an insoluble portion, and is essentially a mixture of fellinate and cholate of ammonia. Absolute alcohol takes up from the extract, exhausted by æther, a blackish-brown, bitter, hygroscopic mass, which is void of smell, of a vitreous lustre, and of difficult solution in water; it consists essentially of biliverdine, bilifulvine and bilifellinic acid. Alcohol of 0.968 extracts from the remaining residue a coal-black, shining body, which dissolves in alkalies with a dark brown colour, and in concentrated sulphuric acid and hot acetic acid, from which solutions it is again precipitated respectively by acids and alkalies; it is insoluble in nitric and muriatic acids, and is thrown down of a brown colour from its alcoholic solutions by barytic water and acetate of lead; it burns without leaving any residue. After acting with the above three solvents, a very small residue remains of the aqueous extract of the brown oil; a far more considerable one from those of the bright brown and bright kinds. This residue contains an organic substance, the nature of which has not yet been ascertained, and some inorganic salts, in which chlorine, phosphoric acid, sulphuric acid, lime, magnesia and soda, could be detected, but neither potash nor iodine. Besides the above-mentioned black substance, which could not be identified with any of the constituents of the gall described by Berzelius, the author also found small quantities of some apparently peculiar bodies. These substances are probably only further products of the decomposition of the bile, and not of any interest.

On making a comparative examination between the glycerine separated in the saponification of the cod liver oil with the glycerine of olive oil and of pork fat, the author found that the mother-ley, separated immediately after the decomposition of the soda soap, on being treated with sulphuric acid and allowing the sulphate of soda to separate by crystallization, afforded a product of a far darker colour in the liver oil. On precipitating the aqueous solutions with basic acetate of lead, they were all three decolorized; but all these solutions of glycerine again became coloured on further evaporation, even when this was effected in vacuum; and on being heated exposed to the atmosphere, the body which is precipitated by basic acetate of lead is constantly formed anew.—*Pharm. Central-Blatt*, Oct. 4.



## CHEMICAL PREPARATIONS.

*Preparation of the Lactate of the Protoxide of Iron.**By Prof. WÖHLER.*

THE following is the most simple and advantageous method of preparing the lactate of the protoxide of iron:—Finely pulverized milk-sugar and pure iron filings are conveyed into acid whey, and the mass digested, with frequent shaking, several days at a temperature of about 86° to 104° Fahr. To 2 lbs. of sour milk (a quantity which affords several ounces of the iron salt), take 1 oz. of milk-sugar and as much iron. The iron dissolves gradually in the free lactic acid with slight evolution of hydrogen; at the same time fresh lactic acid is formed by the action of the caseine on the milk-sugar. As soon as it is observed that the milk-sugar is dissolved, a fresh portion is added; and when, after repeated additions of milk-sugar, sufficient lactate of the protoxide of iron has been produced, which is generally seen from its beginning to be deposited as a whitish crystalline powder, the whole mass is heated to boiling, and filtered while hot into a vessel that can be closed. On cooling, the lactate of the protoxide of iron separates in greenish-white crystalline crusts, composed of small prisms; the separation is not finished until after several days. The liquid is then decanted, the crusts broken up, washed over once or twice with cold water, placed on blotting-paper, and allowed to dry at a *gentle* heat, but as quickly as possible, in order to avoid oxidation, which would otherwise ensue. The salt thus obtained is sufficiently pure for pharmaceutical purposes; it is however easy to obtain it perfectly pure by dissolving it in a little boiling water, and recrystallization. Analysis has shown that a salt thus prepared is a pure lactate of the protoxide of iron. It is not worth while to separate by evaporation of the mother-ley the salt still remaining dissolved in it.

Lactate of zinc may be obtained with the greatest ease in colourless crystals, precisely in the same manner, by employing zinc filings.—*Archiv der Pharm.* for October.

*On a new Method of preparing Nitrous Æther.* By M. PEDRONI.

I was led by chance to the following new method of preparing nitrous æther (nitrite of the oxide of ethyle):—Having poured a remnant of alcoholized sulphuric æther in a boiling state into a flask which contained some crystallized nitrate of ammonia, a reaction ensued, and I could distinguish the odour of nitrous æther. I repeated the experiment several times, and always with success. The following are the proportions which I employ:—

11 grammes of crystallized nitrate of ammonia.

8 ... sulphuric acid.

9 ... alcohol.

The alcohol is first mixed with sulphuric acid, and then poured on the salt; the distillation is carried on, as for water, over a naked fire; sulphate of ammonia is formed. The nitrous acid, in *statu*



*nascenti*, combines with the alcohol, forming the nitrite of the oxide of ethyle, aldehyde and water.

In the preparation of nitrous æther with alcohol and nitric acid, it is necessary to operate on a very small quantity of the mixture from the almost instantaneous production of æther; with the present method, on the contrary, the operation proceeds gradually and without any danger.—*Comptes Rendus*, Oct. 9, 1843.

*Antimonium Diureticum Ablutum.*

Take of

Crude antimony . . . . .  $\frac{1}{2}$  lb.  
Nitre . . . . . 2 lbs.

Pulverize, mix well and dry, then project in portions into a faintly red-hot crucible. After deflagration, the mass is kept in a soft state for an hour, stirring now and then, and taking care that no coal fall into the crucible. It is then allowed to cool, and is washed with water as long as this removes anything from it.

It forms an insipid white powder, which is insoluble in water, dissolves with difficulty in acids, is not volatile, and does not fuse except at a very high temperature.

It is stated to be diaphoretic, emetic or purgative, and is administered in the form of powder and pills.

It is principally used in obtaining the various preparations of antimony.

*Aqua Carbonica Febrifuga.*

R̄ Quinin. sulphuric. . . . . 0·60 gramme.  
Acidi tartaric. . . . . 4·00 grammes.  
Natr. bicarbon. . . . . 5·00 ...  
Sacchar. pulv. . . . . 30·00 ...  
Aquæ . . . . . 1·00 litre.

The quinine, tartaric acid, sugar and water, are first conveyed into a bottle, and then the bicarbonate, upon which it is closed hermetically. From half a glass to a glass is taken every two hours. Quinine and tartaric acid are also given in Seltzer water, and is considered as a preservative or cure in intermittent fever.—*Journ. de Chim. Med.* for May 1843.

## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

### *On Sugar, its Manufacture and Refinement.*

By CARL HOCHSTETTER.

[Continued from page 698.]

6. *Behaviour of Cane-sugar under the combined action of the influences previously described, and under circumstances such as*



*occur in the Manufacture of Sugar.*—The vegetable juices of the sugar refiner are, as is well known, treated with lime, both the sap of the cane as well as that of the beet-root. The juices are then alkaline, partly from an excess of lime, partly from caustic alkalies, which are formed by the action of the lime on their acids. It is desirable to know what action the lime has when the sugar solutions are mixed with foreign organic substances, and further, when the juices, as is frequently the case, contain previous to their treatment with lime one or several other kinds of sugar. It has been shown above that the alteration of cane-sugar under the influence of nitrogenous substances is not stopped by lime at the ordinary temperature, but is frequently hastened, or at least assisted by it.

When fresh beet-root sap, which had been ascertained by the copper test to be free from every other kind of sugar than cane-sugar, was treated, as in the manufacture of sugar, at a boiling heat with lime, lime compounds were precipitated, the composition of which has been described; and further, a portion of the nitrogenous substances immediately underwent decomposition, producing ammonia. If the clear sap be examined after this process, not a trace of any other sugar can be detected; the cane-sugar has not changed; the clear juice has not become much coloured; it is of a bright yellow wine-colour. When the same juice is boiled in an open flask for an hour or longer and evaporated, ammonia is given off nearly the whole time, while the liquid becomes turbid without the intensity of the colour being increased more than can be explained from the concentration of the liquid. If it be now examined with the copper test, not a trace of altered sugar can be detected, presupposing that the juice continued alkaline the whole time. The precipitates which have formed consist of carbonate of lime, leucine, and another insoluble lime salt.

As in experiments on a small scale very inconsiderable quantities were obtained of these precipitates, while a more accurate knowledge of the products formed during the process of evaporation of alkaline beet-root juice promised to be of interest, the author examined those which are constantly deposited in the evaporating pans of MM. Schmidt and Coqui's establishment near Magdeburg. He found them composed of leucine, carbonate of lime, and two lime salts, of which one was decomposed by acetic acid, the other by muriatic acid. The acids of these salts were of organic origin, but they could not be determined. A black humus-like substance, which puffs up on ignition, melts and smells of burnt horn; a lime soap, the fat acid in which was derived from the fat added during evaporation. Besides these products there were some soluble salts of lime, and in the evaporated juice also a quantity of foreign organic substances, which were more or less modified by the action of heat and the alkalies.

It is fully proved therefore, by the precipitates which form in the evaporating pans, that a decomposition of the nitrogenous bodies takes place, since leucine is solely produced by the action of alkalies on these substances, and ammonia is developed with the formation



of this product. While these actions and decompositions are taking place the sugar undergoes no change, without doubt because all the acid products, the formation of which must be assumed, are combined at the moment of their origin by the alkali present (the lime); the other indifferent portion of the products of decomposition have no chemical action on the sugar.

Heat is necessary for the production of these phænomena, and it must be of an intensity exceeding, or at least attaining to, the temperature of boiling water. When, for instance, alkaline beet-root juice is evaporated in vacuum at a temperature between  $158^{\circ}$  and  $176^{\circ}$  Fahr., scarcely any precipitate is formed which would admit of our concluding on a process similar to that above mentioned; the bright copper pans remain bright, for no insoluble lime salts are deposited. The different behaviour of the alkaline juice in the vacuum pans and in the open pans cannot be ascribed to the influence of the atmosphere; for the formation of steam during the evaporation is so considerable, that it is not possible to suppose that the atmosphere can come in contact with the liquid.

The phænomena are widely different when, as is frequently the case, the juice, previous to its treatment with lime, has become somewhat altered, especially when it contains other kinds of sugar, as fruit or grape-sugar.

A solution of sugar which contains only traces of a different kind of sugar is coloured almost immediately on being heated with lime-water. We have therefore in lime-water, or in a solution of sugar-lime, a test for detecting the presence of any other sugar in *colourless* solutions of sugar. If sufficient fruit or grape-sugar be present in an alkaline solution, the alkalinity soon disappears entirely, and carbonic acid no longer precipitates any lime. If a concentrated solution of sugar-lime be conveyed into a mixture of grape and fruit-sugar, and a liquid thus formed of about  $20^{\circ}$  Beaumé, not a trace of the two foreign kinds of sugar can be detected after two hours' boiling; they are entirely decomposed. The cane-sugar of the sugar-lime remains unaltered in this process when there is some free alkali present. The liquid acquires a deep dark brown colour, and deposits some precipitates. If but a small portion of alkali be present the action is not so intense.

But if some beet-root juice is taken which contains, previous to the treatment with lime, other kinds besides cane-sugar, it exhibits an entirely different behaviour to that of good juice containing only cane-sugar; the clear sugar immediately becomes coloured, according to the condition of the juice, yellow, deep yellow, or reddish yellow. The lime and other free alkalies have acted on the other kinds of sugar precisely in the same manner as in a colourless solution of cane-sugar, but which has been modified by the action of nitrogenous substances under the influence of the atmosphere at the ordinary temperature. If a large quantity of a foreign sugar is present, the action of the alkalies continues during the process of evaporation as long as there is any free alkali, and of those kinds of sugar which are decomposed by alkalies. Bad



juice, therefore, although it had been very alkaline, loses its alkalinity entirely on evaporation. This is however not solely and exclusively owing to the presence of foreign kinds of sugar, but is in part due to the considerable quantities of nitrogenous substances which cannot be separated either by boiling or by lime, and which bad juice always contains in larger quantity than unaltered juice, and it is these which consume a portion of the alkali present in the process of their decomposition. Strongly alkaline juice indicates, therefore, after long evaporation, no other kind of sugar with the copper test, because it has been destroyed by the action of the alkalies.

From this consideration it results that in the juice of the beet-root, and without doubt also in that of the cane, which contain no other sugar than cane-sugar previous to their treatment with lime, no cane-sugar is decomposed in the process of evaporation even over a naked fire and at a temperature above that of boiling water, presupposing however that the liquid had always continued alkaline, and that the colouring constituents of the evaporated juice arose from the soluble products of decomposition of the nitrogenous substances. But if the juice, previous to its treatment with lime, contained some other sugars, then the evaporated sap will also contain, besides the above products, the products of the decomposition of these sugars under the influence of alkalies; but even in this case no cane-sugar is altered. These products are for the greater part soluble in the saccharine juice, and are of a very colouring nature. The results of these researches are—

1st. A pure solution of sugar is the more readily altered by the influence of the atmosphere the greater the surface presented by it at the usual temperature. This change is perceptibly increased when the solution of sugar contains such nitrogenous bodies as occur in the juices of the beet-root and the sugar-cane. The modification consists in the formation of a new kind of sugar, without doubt fruit-sugar. The presence of nitrogenous bodies gives rise to a secondary change in the so-called mucous fermentation; under certain circumstances however vinous and lactic fermentation result.

2nd. A solution of pure sugar is not perceptibly decomposed on boiling for a time corresponding to that which is necessary in the operations of boiling on a large scale; but when the solution of sugar contains nitrogenous substances, the sugar is considerably altered under such circumstance.

3rd. The alkalies (lime) do not alter the sugar in its aqueous solution, even at a temperature of 248° F.: they protect the sugar from the action of the products of decomposition of the nitrogenous substances at a high temperature. Under certain circumstances the alkalies may favour an alteration of the sugar, *i. e.* with the presence of nitrogenous substances at temperatures which are favourable to the processes of fermentation.

4th. The nitrogenous substances which the beet-root contains are able to modify cane-sugar, both at the ordinary temperature as well as at a boiling heat. In the former case, these modifications occur as mentioned under No. 1; in the latter, new kinds of sugar,



without doubt fruit and grape-sugar, are formed by the products of decomposition of these bodies.

5th. Most salts, but especially the chlorides of the alkalies and the alkaline earths, prevent the crystallization of cane-sugar without exerting any decomposing or modifying influence. The action appears to be purely mechanical, for the uncrystallizable sugars have precisely a similar effect.

6th. The action of acid bodies, of any kind whatsoever, of forming in solutions of cane-sugar, grape and fruit-sugar, according to circumstances, has not been considered minutely, since this influence has been most accurately observed.

[To be continued.]

## REVIEWS.

*Lectures on Polarized Light.* By JONATHAN PEREIRA, M.D.

London: Longman, Brown, Green and Longmans.

THE subject of these lectures is one of the most interesting in science, and at the same time promises to be of the greatest practical use to chemists, who will feel, we are sure, much indebted to the author for having published them in a form which is far more convenient than when scattered through the pages of several numbers of a periodical. The author first enters into a detailed and very lucid account of the physical properties of light, and the theories which have been proposed to account for its many and wondrous phænomena; then passes on to the description of the various kinds of polarization, coloured, circular and elliptical; the different methods and instruments for effecting these, and last of all their useful applications. From these latter we select the following, as being closely connected with a subject contained in our last and present Numbers, viz. the manufacture of sugar.

“Some kinds of *sugar*, when dissolved in water, yield solutions which have in a greater or less degree the property of rotating the planes of polarization, some to the right, others to the left. Hence polarized light may be sometimes used as a test of the presence of sugar, and the degree of rotation becomes an indication of the quantity and even quality of the sugar present. Biot examined by this test a specimen of sugar-cane juice, and found that it indicated the presence of 20 or 21 per cent. of sugar. Peligot subsequently analysed it, and found 20·9 per cent. of sugar. Biot therefore suggests that those who make, as well as those who refine sugar, might resort to this test as a means of determining the amount of sugar in different juices or solutions. To the colonist it would prove useful by pointing out the saccharine strength of the juice at the mill, and to the sugar refiner it would be valuable by enabling him to determine the absolute strength of raw sugar.

“The sugars are prepared for examination by dissolving them in water, and decolorizing the solutions, when necessary, by filtering them through purified granulated animal charcoal.



“Several sweet or saccharine substances do not indicate any circular polarization, and of those that do, some indicate right-handed, others left-handed circular polarization.

1. Cane-sugar .....		<i>Right-handed.</i>
2. Grape-sugar ( <i>Glucose</i> of Dumas) .....		<i>Ditto.</i>
3. Incrystallizable sugar ( <i>Chulariose</i> of Sou- beiran).....	a. Incrystallizable sugar of Honey.....	<i>Left-handed.</i>
	b. Incrystallizable sugar, obtained by the action of acids on cane- sugar .....	<i>Ditto.</i>
	c. Incrystallizable sugar of the juices of fruits .....	<i>Ditto.</i>
	d. Incrystallizable sugar, obtained by the alteration of cane-sugar. This constitutes the greater part of mo- lasses .....	<i>Ditto.</i>
4. Mannite .....	O.	
5. Glycerine.....	O.	
6. Liquorice-sugar .....	O.	

“The grape-sugar referred to in this table exists ready formed in honey and in diabetic urine. It is deposited when the acidulous juices of fruits have been saturated and sufficiently concentrated. Moreover, it is produced by the action of diastase on starch, as well as when syrup, obtained by the action of weak acids on starch or sugar, is abandoned to itself.

“Cane-sugar dissolved in water causes *right-handed* polarization. A strong syrup made with refined sugar shows the colours most brilliantly. When this kind of sugar is subjected to heat, especially in contact with acids, it loses its crystallizability, and then acquires *left-handed* polarization. In sugar-refining the object is never to let the syrup get beyond the first zero; that is, not to convert crystallizable unto uncrystallizable sugar. Raw sugar contains, however, both crystallizable and uncrystallizable sugar; the latter alone should constitute treacle. But, from Soubeiran’s optical examination, it appears that treacle contains a portion of crystallizable sugar.”

From the observations of M. Hochstetter, it would appear that the quantity of cane-sugar contained in the molasses is far more considerable than has been supposed.

“The optical characters of sugar have been made use of to detect fraud in pharmacy. In 1842, more than a ton of a substance purporting to be *manna* was offered for sale in Paris at less than five-pence per pound; the excuse given for the unusually low price was, that cash was immediately required. Suspicion was raised, and the substance was submitted to careful examination, the result of which was the establishment of the fact, that it was not manna, but potato-sugar. Its aspect, taste, fermentability (mannite not being fermentable), and the presence of sulphate of lime proved this. Biot submitted it to a very careful optical examination, and found its characters to be those of a starch-sugar. Manna contains two kinds of saccharine matter, one called *mannite*, and the other a *fermentable sugar*. Now mannite when pure has no rotative power on polarized light, but commercial manna has a slight effect, owing to the presence of a small quantity of fermentable sugar. This ficti-



tious substance however had the same effect on plane polarized light as sugar prepared by the action of acids on starch, when the action is arrested at the first phase of its transformation."

Circular polarization may likewise be made available to the detection of mixtures of oils one with another, some being left-, others right-handed; and from a paper recently published in the 'Comptes Rendus,' by M. Bouchardat, it would seem that it may also be turned to account in ascertaining the purity of sulphate of quinine, which now enjoys such extensive medicinal use: we have no doubt it will find many more applications. The subject has been treated *con amore*, and we have great pleasure in cordially recommending this work to the attention of our readers.

## PATENTS.

*Patent granted to Arthur Harvie, Wilmington Square, for Improvements in the Process of Vinous Fermentation.*

THE improvements proposed by the patentee consist in performing the process of vinous fermentation in close vessels, so that the gas evolved may be conducted into liquids undergoing fermentation; and it may also be further employed for saturating any liquids with carbonic acid which may require such impregnation.

In conducting the process four air-tight vats or vessels are preferred to be used, but a greater number may be employed if required. Nos. 1, 2 and 3 are fermenting-vats, and No. 4 may contain a solution of potash, a solution of subacetate of lead, water, or other fluid desired to be impregnated with carbonic acid gas. The fluid to be fermented is poured into the vessels 1, 2 and 3 through an opening in the top; and they are connected together by pipes, rising out of the tops of the several vessels, and leading from one to the other. An additional pipe proceeds from the vessel 1 to 3, for the purpose of conducting back the gas to the latter vessel; and a pipe connects 3 and 4 together, for the purpose of drawing off the surplus gas, in order to impregnate the liquid contained in the vessel 4 with carbonic acid; but, to allow of the free passing and repassing of the gas through the fermenting vats, the pipe of the vat 4 descends much lower into the liquid contained therein than in the other vats, and by that means a greater degree of pressure is given to the gas; its escape therefore into that vessel will not be so free as a return to the fermenting vats, and consequently it will pass and repass through the fluid which is undergoing fermentation before it finally escapes into the vat 4 and is absorbed by the liquid therein. When the process of fermentation is completed (which should be carried on at as low a temperature as possible, in order to evolve slowly the carbonic acid gas), the fluid may be drawn off by cocks attached to the bottom of the vats.

The advantages stated by the patentee to arise in the adoption of close vessels, as above described, for the purpose of vinous fermentation, are a more full and complete decomposition of matter, made subject to vinous fermentation, and the additional employment of the gas when it escapes into the vessel 4.—Sealed Nov. 8, 1842.



# THE CHEMICAL GAZETTE.

No. XXVII.—December 1, 1843.

## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Products of Decomposition of Glycerine by destructive Distillation.* By Prof. REDTENBACHER.

It is well known that the peculiar acrid smelling principle which M. Hess formerly considered as being aldehyde, and which Berzelius has termed *acroleine*, is formed solely on the destructive distillation of fats containing glycerine, and may therefore be taken as the most certain proof of its presence. The present investigation relates especially to the nature of acroleine.

The author distilled fat and oil in an apparatus, to which were annexed several Woulf's bottles containing water. The fat acids collected in the first recipient, the acroleiniferous oil floated in the bottles on the surface of the water, and a mixture of carbonic acid and carburetted hydrogen escaped towards the close of the operation, which had still a very powerful smell of acroleine. These gases were passed through absolute æther, saturated with ammoniacal gas. Carbonate of ammonia was deposited in considerable quantity; this M. Hess supposed to be aldehyde-ammonia. When the layers of oil in the flasks were subjected along with the aqueous liquid to rectification, they commenced boiling below  $104^{\circ}$ , but gradually rose to  $176^{\circ}$  and above; but that which distilled over above  $176^{\circ}$  had very little odour of acroleine. If the product obtained between  $104^{\circ}$  and  $140^{\circ}$  Fahr. is rectified over chloride of calcium, the boiling point again varies; most of the oil passes over at  $126^{\circ}$ . It was found by analysis to contain—

	I.	II.	III.	IV.	V.	VI.
Carbon . . . . .	64.96	68.40	65.96	67.70	68.16	67.20
Hydrogen . . . . .	8.76	9.44	8.93	9.15	9.00	9.26

The oil absorbs oxygen easily and in large quantities, without giving off carbonic acid. The products of a fractioned distillation, performed with exclusion of the air, contained—

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Carbon . . . . .	68.97	68.21	67.04	77.76	87.04	77.88	78.26	77.06	76.82
Hydrogen. . . . .	9.39	9.46	9.01	10.61	11.06	11.03	10.88	10.69	10.58



No result could therefore be obtained in this manner, since on the distillation of fats the products of decomposition of the fat acids remain mixed with those of the glycerine. Nor can acroleine be easily prepared from pure glycerine; the greater portion of the glycerine passes over unaltered, and the mass then puffs up considerably; there is no evolution of gases which might carry over the acroleine with them. When acid sulphate of glycerine is submitted to distillation, sulphurous acid, acroleine, and a new acid which very much resembles acetic acid (*acrylic acid*), are given off. When glycerine is heated with hydrate of potash or soda-lime in a silver dish until the mass has become white, and is then distilled with water and sulphuric acid, formic acid, acetic acid, acrylic acid, and some acroleine, are obtained. Acroleine is best obtained by distillation of glycerine with anhydrous phosphoric acid, or with bisulphate of potash in excess; in both cases it is accompanied by acrylic acid and its products of decomposition, and in the latter case it is likewise mixed with sulphurous acid. In carrying on the distillation, it is necessary, in order to avoid its powerful effects on the eyes, to employ a Liebig's refrigerator, and to have a tube from the recipient going up the chimney or out of the window. The product separates into an aqueous acid liquid and a supernatant oil, consisting mostly of acroleine, with *acrylic resin*,—a product of decomposition of the acroleine. The entire product of the distillation is mixed with oxide of lead, digested with it until the acid reaction disappears, and then rectified in the water-bath, when the acroleine together with some water pass over below  $212^{\circ}$ . It is dried over perfectly neutral chloride of calcium. All the operations should be effected with exclusion of the air, in connected apparatus which close air-tight, and from which the atmosphere has been expelled by carbonic acid; otherwise the acroleine soon undergoes alteration, and there is moreover very much to suffer from the acid vapours. The quantity of acroleine obtained is proportionably small and variable, since the products depend very much on the temperature, and from the ebullition of the mass in the retort it is impossible to work with a suitably high temperature. Sometimes no acroleine at all is obtained, but only acrylic acid.

Pure acroleine is transparent, colourless, highly refractive, and possesses an odour which excites the nose and eyes in a most dreadful manner; the irritation may even go so far as to produce fainting, without however being followed by any ill consequences. The taste is biting and burning. It is lighter than water, boils at  $126^{\circ}$  Fahr., dissolves in 40 parts of cold water, to which it imparts its odour and taste. It dissolves most readily in æther. The originally aqueous solution soon becomes acid by exposure to the air; a drop of pure anhydrous acroleine does not redden blue litmus paper, but it soon solidifies to a white crystalline mass (or evaporates without this appearance), and then leaves a red stain. Acroleine burns with a bright white flame; it rapidly absorbs oxygen, especially in its aqueous solution, and is converted into white *disacryl* and acrylic acid; even when hermetically inclosed in dry glass bulbs, it gra-



dually undergoes this change. Chlorine and bromine form oily bodies with acroleine with evolution of hydracids. It is carbonified by concentrated sulphuric acid, with evolution of sulphurous acid; with nitric acid it disengages nitric oxide with slight deflagration, and is more highly oxidized. When ammonia is added to an æthereal solution of acroleine, the odour disappears, and a white crystalline salt separates, which is carbonate of ammonia. Acroleine and potash act very powerfully on each other, the smell disappears, and an odour of cinnamon is given off with formation of resinous products. Peroxide of lead has no action upon acroleine, but with oxide of silver it becomes very strongly heated, and there is formed acrylate of silver. Water saturated with acroleine affords a white and curdy precipitate with nitrate of silver; on standing, the precipitate is quickly reduced, and the liquid smells of acrylic acid and acetic acid; the vapour of acroleine passed through red-hot tubes is decomposed into water, carburet of hydrogen and carbon.

On account of the volatility and hygroscopic properties, the substance is somewhat difficult to analyse; it is best to blow two glass bulbs one after the other, to fill the front one with acroleine and the hinder one with chlorate of potash, and so to bring them into the tube of combustion; on analysis it was found to consist of—

	I.	II.	III.	IV.	V.	VI.		
C . . . .	61.93	62.87	62.75	63.57	64.58	66.55	6=	445.12 64.55
H . . . .	7.59	7.32	7.37	7.39	7.38	7.27	4=	49.92 7.08
O . . . . .							2=	200.00 28.37
								<hr/> 695.04 100.00

The specific weight of the vapour was determined according to the method of Gay-Lussac, and was found to equal 1.897; but 6 vol. C = 5.0182 + 4 vol. H = 0.5504 + 2 vol. O = 2.2052 = 7.7738 = 4.19434; if therefore glycerine =  $C^6H^8O^6$ , we have acroleine = glycerine —  $H^4O^4$ , and it would be formed from the glycerine simply by the extraction of 4 atoms water. It would seem to result from the analysis of the following acid that we must admit acroleine to be the hydrate of the oxide of acryle =  $C^6H^3O + HO$ , in which is contained the new radical *acryle* =  $C^6H^3$ . But it is known that Stenhouse found in palmatine a body =  $C^6H^4O^2$ , combined with palmitic acid. Playfair found the same in myristine, and according to an analysis of Pelouze, it also occurs in stearine. The best analytical results respecting stearine (76.71 C, 12.35 H, 10.94 O) lead in fact to the formula  $C^{74}H^{71}O^8$  (or  $C^{68}H^{68}O^7 + C^6H^3O$ , *i. e.* oxide of acryle + hydrated stearic acid), which requires 76.9 C, 12.14 H, and 10.96 O. It is therefore rendered very doubtful by these experiments, whether the different kinds of fat contain oxide of acryle ready formed or its hydrate, but certainly not the glycerine  $C^6H^7O^5$ , deduced by Pelouze from his analysis of the sulpho-glycerates. To settle this would require a complete analytical revision of the fats.

[To be continued.]



*On the Tin Mines of Tenassirim Province. By Prof. ROYLE.*

The author commences by observing that though tin is found in few parts of the world, yet that it can be clearly proved to have been employed from very early historical times: he next enters into various interesting inquiries respecting the names under which it was known by the several nations of antiquity, and the country from whence it was procured, considering it more probable that the Greeks and Romans were supplied from the East, than that commerce should have extended in very early times to such a remote country as Cornwall.

After some short notices of the old geographers and travellers who have spoken of the tin of India, the author enters into an account of the several localities in which it has been discovered, the situations in which it usually occurs, and the methods of extracting and smelting it.

The island of Banca, situated at the eastern extremity of Sumatra, is the most celebrated of the Indian tin districts. The surface of this island presents short ranges of granitic hills, flanked by inferior ones which abound in red ironstone. The tin occurs in the low alluvial deposits at the base of the granitic hills, and about twenty-five feet from the surface. The ore is a peroxide of tin yielding about 60 per cent. of metal. From 1813 to 1816, whilst the island was in possession of the East India Company, three millions of pounds were raised annually, and since that time the quantity is believed to have increased. It is stated on the authority of Captain Tremenhere, that some of the tin of Banca is extracted from the side of a hill about 300 feet high.

The island of Lingen, at the southernmost point of the peninsula of Malacca, particularly in the neighbourhood of Palembang on the east coast, also produces tin, as does the island of Sumatra at various points along the eastern coast, and near Bencoolen on the western coast.

The whole peninsula of Malacca on its west side is also a stanniferous district. A range of lofty granitic hills runs from north to south through this country: the lower ridges of the neighbourhood of Malacca consist of conglomerate, with clay ironstone, which agrees in character and composition with a rock common on the Malabar coast, described by Dr. Buchanan under the name of Laterite. Severe shocks of earthquakes are occasionally felt in Malacca; and there are several springs with temperatures of  $110^{\circ}$  and  $180^{\circ}$  F. The tin ore is extracted from the low alluvial plains at the base of the granitic range, and is not unfrequently mixed with gold. The exported quantity of the latter amounts to about 19,800 oz. annually. The ore occurs in the horizontal seams of considerable extent, and from six to twenty inches in thickness, at a variable depth from the surface.

The author next describes the native processes for working and smelting the ore, and states that about 70 per cent. of metal is obtained at a cost of twenty-three shillings the cwt.: on the authority of Capt. Newbold, the gross annual quantity of tin raised in the peninsula of Malacca is given at 4,325,000 lbs.



The British provinces on the coast of Tenassirim contain about 30,000 square miles, having a north and south range of mountains for their eastern boundary. The mineral products of these provinces are tin, iron, and coal. The north and south range is stated by Dr. Helfer to be composed of granite and gneiss; and the northern and middle parts of the country to consist of transition slates and limestones. The country south of the Maulmain river, the province of Ye, towards Tavoy, is a sterile slate district covered with bamboo. Amherst province presents isolated ridges of limestone with fertile land at their bases: to the south are sandstones and conglomerates. Tertiary formations, chiefly argillaceous, occupy the higher parts of Amherst and Ye provinces, the plains of Tavoy and Kalleevung, those between Tavoy and Pailon, the valley of Jaun-biank and of the Tenassirim river, and the elevated land of Meta-mio.

In 1837 Dr. Helfer discovered tin near lake Loadut, about 110 miles N.N.E. of Maulmain, and in 1840 he reported the country to the north of the Pakehan river to be the richest stanniferous district within the Tenassirim provinces: the ore is found in the debris of primitive rocks, and the range is stated to be a continuation of the Siamese tin district of Rinowng. Domel island and the banks of the Boukpeer are also cited as localities yielding tin.

Capt. Tremenhere's account of the tin of the Tenassirim provinces is, that it occurs chiefly in the beds and banks of those rivers which issue from the primitive mountains: on the Thengodong river, in the immediate vicinity of the coal mines on the Great Tenassirim river, 11,889 grains of peroxide of tin were collected in an hour and a half. Along the courses of the streams which flow into the Little Tenassirim river it occurs in thin beds, in gravel; and Capt Tremenhere calculates, from a short trial he made, that two men could obtain by washing the gravel about 5 lbs. 2 oz. 464 grs. of tin per day.

At Kahan, on the right bank of the Great Tenassirim river, eleven miles from Mergui, Capt. Tremenhere found a vein of tin about three feet and a half wide, nearly vertical, and included in a white decomposing granitic rock. The ore is described as equal to that from Banca. It is conjectured that tin may ultimately be found in the small isolated granitic hills which rise out of the alluvial plain in the neighbourhood of Kahan.—*Proc. Geol. Soc. of London.*

*On Pyroguaiacic Acid obtained by the Distillation of Guaiacum Resin. By A. M. SOBRERO.*

Guaiacum, submitted to dry distillation, gives off water and an oily substance, composed of a neutral oil lighter than water, and of an acid oil which is heavier. The acid is easily separated from the neutral oil which accompanies it by careful distillation. The neutral oil is the first to pass over; it is necessary to increase the heat, as the boiling point of the acid is not lower than 400° Fahr. On fractioning the products, there is obtained, when about two-thirds have distilled over, an acid which may be considered as pure. To



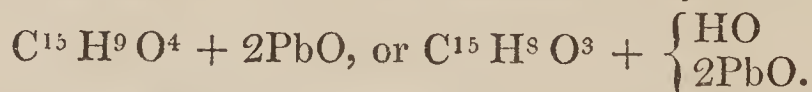
obtain it colourless and dry, it must be distilled in a current of dry carbonic acid.

This acid, which I have called pyroguaiacic acid, is heavier than water, and diffuses a very strong odour, which resembles that of guaiacum, when projected on incandescent coal; it has a spicy taste analogous to that of cloves; it is soluble in alcohol and æther, but is very little soluble in water; its density is 1.119 at 72° Fahr.; it boils at 400° Fahr. It oxidizes readily by exposure to the air, becomes red, and at last opake. It dissolves in a solution of caustic potash, but does not decompose the alkaline carbonates. The solution of this acid in caustic potash exposed to the air becomes black, and gives a precipitate of carbon. An alcoholic solution of pyroguaiacic acid reduces gold and silver, and causes iron and copper, in their saline combinations, to pass to a lower degree of oxidation. Nitric acid acts violently upon it, and produces oxalic acid.

Chlorine gives rise to a considerable disengagement of hydrochloric acid, and to the formation of a crystalline compound, which is easily fusible, and sublimes at a moderately elevated temperature, and then crystallizes in long white needles.

Pyroguaiacic acid dissolved in alcohol throws down an aqueous solution of the tribasic acetate of lead. The salt is amorphous, flocculent, white, curdy, like chloride of silver; it fuses at 413°, and becomes transparent and brittle like a resin; it dissolves in alcohol, from which it is precipitated on evaporation, or by the addition of water. The two salts thus precipitated have the same composition.

The elementary analyses of the acid were made on a product of simple rectification, and on some acid extracted from the lead salt; the results obtained were identical. The combustions were performed with a current of oxygen. The results of the analysis lead to the formula  $C^{15}H^9O^4$ , which is confirmed by the analysis of the lead salt, the composition of which is expressed by



The density of the vapour of pyroguaiacic acid was found by experiment to be 4.898, from which it is evident that 1 equivalent of acid represents 4 equivalents of vapour.—*Journ. de Pharm.* for Nov.

*On the Active Principle of the Gastric Juice.* By M. PAYEN.

M. Blondlot has kindly afforded me an opportunity of repeating his beautiful experiments, and has placed at my disposal some of the gastric juice obtained by his ingenious method\*, for some chemical researches which I wished to undertake. On operating in a comparative manner, I was able to confirm without difficulty the following phænomena:—Under the influence of the gastric juice for eight hours, and at a temperature between 97° and 103° Fahr.,

1st. Boiled *beef* and *pork* were disaggregated so as to be easily

\* See this Journal, p. 628.



reducible by slight agitation into a pulpy substance containing some fibrils.

2nd. *Fish gelatine* (Ichthyocolle) was disintegrated and partially dissolved. The solution had lost the property of becoming gelatinous.

3rd. Slices of the *skin of an ox*, dried and cut perpendicularly to the epidermic surface, exhibited a large portion of the cellular tissue disaggregated and dissolved, so that the loosened hairs might be seen traversing the epidermis.

4th. *White transparent gelatine* had become liquified. It no longer formed a jelly on cooling.

The same substances, in equal volumes, placed in water slightly acidulated with hydrochloric acid, so as to offer the same acidity, did not undergo, after eight hours of contact, at a temperature of  $97^{\circ}$  to  $103^{\circ}$ , any appreciable change; the muscular tissues had retained their forms and a great resistance, and the gelatine solidified on cooling into a transparent solid jelly.

I was able to add to these confirmative experiments the direct observation of the action of the liquid of the stomach on a portion of compact bone. Two cylinders were prepared of equal dimensions (7 millimetres in diameter, 32.1 in height); one of the two, surrounded by a piece of gauze and fastened by a thread, was introduced into the stomach of the dog, which remained in my laboratory for fifty hours. At the end of this time the aperture was opened, and the cylinder, still enveloped, was drawn out by means of the thread; it was lessened in all its dimensions to such an extent that its mean diameter was then only 4.6, and its height 28 millimetres; its weight had been reduced from 2.780 to 1.005 grammes. It will be easy to judge of these effects on comparing the sound cylinder with that partially digested, which I have laid before the Academy: this latter, it will be seen, has retained its primitive hardness, the angles of the bases are rounded, the surface striated with slightly prominent lines, corresponding without doubt to the osseous portions, the texture of which was more dense. It is therefore evident that the action of the gastric juice disintegrates in peripheral layers the whole of the osseous substance, while, as is well known, bones placed in dilute hydrochloric acid have only their calcareous salts removed, and exhibit after the reaction their organic tissue *hydrated* and flexible.

This latter and curious confirmation of the results announced by M. Blondlot induced me, availing myself of his kind offer, to continue some researches begun some years ago under less favourable circumstances. Some years since M. Valentin offered to my friend M. Magendie to repeat in his presence the experiments of artificial digestion, with what was then called *pepsine* by M. Schwann and Prof. Müller. This substance, the discovery of which had excited the attention of German physiologists and chemists, was said to be contained in a dilute solution of hydrochloric acid, which had been allowed to remain in a calf's stomach for some hours. The experiments were made at the Collège de France. A bath of constant temperature was employed, and several substances, principally



muscular tissue and coagulated albumen, subjected for twelve hours to the digestive liquid, and at the same time, for the sake of comparison, to the action of acidulated water. The examination of the results was made by MM. Magendie, Valentin, Poisseuille, some other persons and myself; they were all found to be negative; the meat had remained hard, and the albumen had retained the angular forms of all its fragments. M. Valentin attributed the want of success to the weakness of the acid employed, which diffused less vapours than that used by M. Schwann.

I afterwards made some new experiments, but I found it impossible to obtain positive effects, and to extract by the processes of M. Schwann, or of others which I tried, any principle to which the special property in question could be attributed.

Having now at my disposal a normal gastric juice of great energy, I hoped to be more successful; and, in fact, in the very first experiments made in the same direction that I had followed formerly, I succeeded in isolating a white or slightly amber-coloured transparent substance, very soluble in water, easily dried, and of such energy that it would disintegrate more than 300 times its weight of muscular tissue of boiled beef, and much more quickly than the gastric juice itself. The name of pepsine is scarcely applicable to this active substance, since it is secreted not solely when the animal is hungry, but when the food reaches the stomach and stimulates it; for this reason I am induced to give it the name of *gasterase*. The specimens which I have the honour of presenting to the Academy have been prepared by two processes, of which I have not had time to determine which is the best; but I have described them in the sealed packet deposited on the bureau.

If I do not publish at present these methods of extraction, it is that I hope to give them more perfect, and to join to them some analytical results, which will enable us to determine with greater precision the nature and the extent of action of this active principle.—*Journ. de Pharm.* for November.

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## ANALYTICAL CHEMISTRY.

### *On the Analysis of the Ashes of Plants.*

M. HERTWIG has examined a considerable number of plants, as to the amount and composition of their ashes. The plan followed in these analyses was as follows:—

The ash to be analysed was exposed for a considerable length of time, in a platinum crucible, to a strong red heat, with as great access of air as possible; in most cases the combustion of the carbonaceous matter was complete. To obtain the caustic lime, which had been formed from the carbonate at this temperature again in combination with carbonic acid, a fixed quantity of the ignited ash was uniformly moistened with carbonate of ammonia in the crucible,



and after being left to stand for some time, dried, and exposed to a faint red heat; when the crucible had become cold, its weight was taken, and it was then employed for analysis. The ash thus prepared was now extracted with boiling water, until the water which passed left no residue on platinum foil: upon this the portion of the ash insoluble in water was dried, and exposed to a red heat. It consisted, in all the ashes examined, of silica, carbonate of lime, phosphate of lime, phosphate of alumina, phosphate of magnesia, and phosphate of the peroxide of iron; the ashes of beech-wood and of beech-bark contained moreover phosphate of the protoxide of manganese.

To separate these substances from each other, the ash was treated with muriatic acid in slight excess, which left only the silicic acid undissolved, which was separated by filtration. From this solution the earthy phosphates and the phosphate of the peroxide of iron were precipitated by caustic ammonia perfectly free from carbonic acid, and the ordinary precautions observed in separating them from the solution, which contained chloride of calcium, chloride of magnesium, and in general phosphate of magnesia. The lime was then precipitated by oxalate of ammonia from the solution, which was subsequently evaporated down to a small volume. After repeated addition of ammonia and standing, the phosphate of magnesia separated as a basic ammonio-phosphate of magnesia, in a crystalline state; from the filtered liquid the magnesia was thrown down by a large excess of phosphate of soda.

The separation of the earthy phosphates, and of the phosphate of the peroxide of iron, was effected in the following manner:—The ignited salts, the amount of which had been previously ascertained, were dissolved in muriatic acid, and then re-precipitated by ammonia; this precipitate was boiled with an excess of acetic acid, in which the phosphate of iron and phosphate of alumina are wholly insoluble, while the phosphates of lime and magnesia are entirely dissolved. The lime was precipitated from the filtered solution by oxalate of ammonia, and from its weight the quantity of the phosphate of lime ( $8\text{CaO} + 3\text{P}^2\text{O}^5$ ) calculated. The phosphate of magnesia was determined by the loss. The residue, insoluble in acetic acid, was dried, ignited and weighed, and then re-dissolved in muriatic acid; upon this the peroxide of iron was separated from the alumina by caustic soda, and their amount determined as basic phosphates.

The soluble portion of the ashes contained carbonate of potash, carbonate of soda, sulphate of potash, and chloride of sodium; no alkaline phosphates were found in any of them. To ascertain the relative proportion of potash and soda, the soluble portion of a determined amount of ashes was employed, and the alkaline salts converted into chlorides. The amount of chloride of potassium was ascertained by means of chloride of platinum, and the chloride of sodium determined from the loss.

The results of the analysis are contained in the following table:—



Ashes of	Beech-Wood.	Beech-Bark.	Fir-Wood.	Fir-Bark.	Fir-Leaves.	Pine-Leaves.	Havannah Tobacco.	Hanoverian Tobacco.	Bean-Straw.	Pea-Straw 1.	Pea-Straw 2.	Leaves of Potato.
Carbonate of potash . . . . .	11.72		11.30				16.18		13.32	4.16		
Carbonate of soda . . . . .	12.37		7.42				1.94	1.61	16.06	8.27	4.34	4.69
Sulphate of potash . . . . .	3.49	3.02	trace.	2.95	29.09	12.67	7.39	12.20	3.24	10.75	11.99	
Chloride of sodium . . . . .	trace.		trace.				8.64	9.24	0.28	4.63	3.72	2.28
Silicate of potash . . . . .						3.90						
Carbonate of lime . . . . .	49.34	64.76	50.94	64.98	15.41	63.32	51.38	40.00	39.50	47.81	49.73	48.68
Magnesia . . . . .	7.74	16.90	5.60	0.93	3.89	1.86	4.09	4.27	1.92	4.05	1.38	3.76
Phosphate of lime . . . . .	3.32	2.71	3.43	5.03		0.35			6.43	5.15	1.15	5.73
Phosphate of magnesia . . . . .	2.92	0.66	2.90	4.18					6.66	4.37	7.82	
Basic phosph. iron . . . . .	0.76	0.84	1.04	1.04	38.36	0.88	9.04	17.95		0.90	3.64	1.30
Basic phosph. alumina . . . . .	1.51	0.46	1.75	2.42		0.71			3.49	1.20		2.75
Phosph. protox. manganese	1.59		trace.									
Silica . . . . .	2.46	9.04	13.37	17.28	12.36	10.31	8.26	15.25	7.97	7.81	15.54	29.81
	97.42	98.39	97.74	98.81	99.11	100.00	99.92	100.52	98.87	99.10	99.31	100.00



Of the substances dried at 212°—

	per cent. ash.
Pea-straw (2) afforded .....	5.047
The leaves of pine .....	6.25
Leaves of fir .....	2.31
Fir-wood .....	0.328
Bark of fir .....	1.785
Beech-wood .....	0.384
Bark of beech .....	6.618

To obtain therefore 100 lbs. of ashes, the constituents of which are indicated in the annexed table, there would be required, supposing the whole to be perfectly reduced to ash, of—

	lbs.
Beech-wood .....	25781
Beech-bark .....	1511
Fir-wood .....	30488
Fir-bark .....	5602
Fir-leaves .....	4329
Pine-leaves .....	1600
Pea-straw (2) .....	1981

Liebig's *Annalen* for April.

## PHARMACOLOGY.

*Observations on Santonine.* By M. MIALHE.

SANTONINE is a principle *sui generis*, approximating to a certain extent to the concrete volatile oils, or *stearoptens*. It was discovered nearly at the same time by Kahler and Alms, and was investigated by Trommsdorff the younger. Santonine exists in several species of the genus *Artemisia*, and especially in those which produce the flower-heads known in the drug trade under the name of *semen contra*.

The chemical properties of this substance are somewhat remarkable; it forms brilliant crystals, which are elongated quadrilateral prisms; it is inodorous and almost insipid, owing to its slight solubility in water, which in the cold does not take up more than the five-millionth part of its weight. This is moreover proved to be the case from its alcoholic solution possessing a very decided bitterness.

Santonine is neutral towards test-papers; nevertheless it combines with bases like an acid, and forms salts, several of which are soluble and crystalline.

Are the eminent vermifuge properties of the *semen contra* owing to the santonine or to the volatile oil which this substance contains? Santonine has, it is said, very decided vermifuge properties in the dose of from 30 to 40 centigrammes; but, according to M. Soubeiran, this property belongs more certainly to the essential oil of *semen contra*. According to M. Calloud, to whose kind-



ness I am indebted for the following information, santonine is a specific poison for intestinal worms. This distinguished pharmacien informs me that he has administered it to hundreds of infants with such success that the results obtained exceeded all expectation. Several physicians, to whom M. Calloud distributed it, have obtained the same results.

If the assertions of my worthy friend are not exaggerated, which I am sure no one will be inclined to think, santonine constitutes without doubt a medical agent destined to render most important services; being nearly insipid, it will be generally preferred to the volatile oil of *semen contra*, the bitterness of which is such that few infants can bear it; but it may be said, since this stearopten has no decided taste, since it is scarcely soluble in water, how is it possible that it can possess a so decided deleterious action on these parasites? Nothing is so easy as to answer this question. Santonine, it is true, is nearly insoluble in water, but it becomes soluble in every proportion in the presence of an alkali. The liquid contained in the portion of the intestinal canal in which the parasites in question ordinarily occur, has a very distinct alkaline reaction; it has therefore the power of rendering this substance soluble, and consequently active. I may, moreover, observe, that the property which santonine possesses of being soluble and absorbable only in the inferior portion of the alimentary canal, renders its efficaciousness more certain. In fact, every good anthelmintic agent must necessarily belong to the class of bodies which are little or not at all absorbable in the stomach. Why, for instance, do a few centigrammes of calomel constitute a vermifuge far more certain in its effects than a quantity of corrosive sublimate equal to that which would result from the partial transformation of the protochloride of mercury into the bichloride, under the influence of the alkaline chlorides contained in our secretions? It is because a weak dose of corrosive sublimate, administered as such, is absorbed in the *primæ viæ*, while the partial transformation of the calomel into sublimate takes place throughout the whole extent of the digestive canal, which enables the poison to attain the intestinal worms in whatever portion of the canal they may be situated.

Although most chemists consider santonine to be insipid, M. Calloud has found it necessary to associate it with from 40 to 44 parts of sugar, to render it palatable to children. The following formula appeared to him most suitable:—

*Santonine Lozenges.*

R <sub>x</sub>	Pulverized santonine . . . . .	4 grms.
	Pulverized white sugar . . . . .	150 ...
	Pulverized gum tragacanth . . . . .	2 ...

Form into 144 lozenges.

M. Calloud has neglected to mention the number of lozenges which should be administered to children; but this is easily obviated by bearing in mind that the dose of santonine which is usually prescribed is from 30 to 50 centigrammes daily, and that each lozenge contains  $2\frac{1}{2}$  centigrammes of active substance.



*Extraction of Santonine.*

The following is the method adopted by M. Calloud:—30 kilogrammes of *semen contra* are placed in a large boiler, along with a sufficient quantity of water, and heated; when it boils, so much milk of lime is added as is requisite to saturate the santonine, and at the same time to fix the greater portion of the colouring matter. The product is then submitted to the action of the press, the residue again placed in the boiler and exhausted by a fresh addition of hot water; it is then expressed again, the decoctions united and allowed to settle; it is afterwards decanted and evaporated; on attaining a certain degree of concentration, it is clarified and strained through linen. The clear liquid is again evaporated, then poured into a large vessel, and a slight excess of hydrochloric acid added to it. After standing for about twenty-four hours, the santonine is obtained in a more or less pure state; it is washed with weak alcohol to remove the greater portion of the resinous fatty substance, the deposit expressed, treated with boiling alcohol and charcoal, and allowed to crystallize. The acid hydrochlorate of lime, even after twenty-four hours' rest, still retains in suspension a certain quantity of santonine; it is therefore necessary to let it stand for a longer time, and if it had not been sufficiently concentrated the excess of acid should be saturated by a little milk of lime, and the whole evaporated again.

The process of extraction here described is certainly practicable, as I have convinced myself experimentally, but there is a want of precision in its details; and I am now engaged in repeating the various methods hitherto proposed, being firmly persuaded that this valuable steropten will soon acquire considerable therapeutical celebrity.—*Bulletin de Therapeutique.*

*On a spurious Radix Pimpinellæ.*

M. Münzel mentions his having obtained from a respectable druggist, instead of the pimpernel root, one which proved on a comparative examination to be that of *Pastinaca sativa*. This root is externally of a brownish-yellow colour, very similar to the pimpernel root, of the thickness of a quill to that of a finger, perpendicular, carrot-shaped, fibrous, and slightly ramified. The substance is more woody, and is consequently easier to break. It exhibits on the surface of horizontal section no brown spots; the taste is not sharp, but mild, somewhat resembling carrot.—*Archiv der Pharm.* for September.

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CHEMICAL PREPARATIONS.*Preparation of the Cyanide of Gold. By M. DESFOSSÉS.*

Two processes have been proposed to obtain this cyanide, which is now employed by some manufacturers in gilding by the method



of M. De la Rive. In the first of these processes the combination of the gold with the cyanogen is effected by the action of the cyanide of potassium on the solution of the chloride of gold; the second, which was proposed by M. Deffers, only differs from the former in the substitution of the cyanide of mercury for the cyanide of potassium.

It has been objected to the first method, that only a small quantity of the cyanide of gold formed can be isolated in a state of purity; and further, that it does not afford a product having always the same composition, on account of the difficulty of procuring perfectly pure cyanide of potassium. With regard to that of M. Deffers, although it affords a purer product, it does not admit of the whole of the cyanide of gold being obtained from it in the first experiment; it is necessary to submit it to several evaporations and desiccations, which lessen the product, and necessarily entail heavy losses from the high price of the precious metal employed in this operation.

I have repeated this process such as it is given in the 'Journal de Pharmacie,' and I scarcely obtained, after the first evaporation, one half the quantity of cyanide which I had expected; the other portion had formed a soluble compound with the mercurial chloride produced by the reaction. The treatment recommended of the mother-waters allows of the isolation of some fresh quantities of the product by successive evaporations and solutions; but they are extremely small, and the separation of the whole of the cyanide of gold remains incomplete, since it does not take place, I presume, except on the expulsion from the liquors of a small quantity of corrosive sublimate, which is carried off by the vapour of water on each evaporation, and which leaves behind in an insoluble state the cyanide of gold with which it was combined.

It is owing to this slow and difficult method of separating by evaporation the sublimate which remains combined with the cyanide of gold, that I sought to modify it in order to render it practicable; I succeeded easily, on employing absolute alcohol instead of water to effect the washing of the cyanide of gold after the first evaporation to dryness. The employment of alcohol, which readily dissolves the chloride of mercury and only takes up traces of the cyanide of gold, renders the separation and purification of this latter very easy. If, at the moment of double decomposition, a slight excess of the cyanide of mercury be added, which saves in gold, this excess is likewise removed by the edulcoration with alcohol, which should be employed until it passes off without any trace of mercury.

I have found that æther might be employed in this operation, taking care to finish with alcohol, which dissolves the cyanide of mercury more readily than the first medium.

*Another Process.*—Those persons who might fear that the cyanide of gold obtained by means of cyanide of mercury would contain some traces of this latter metal, might prepare it by another method, which succeeds equally well. This consists in placing hydrated oxide of gold, precipitated by magnesia according to Pelletier's method, in contact with dilute hydrocyanic acid recently prepared.



On first mixing, the oxide of gold becomes blackish-green (probably constituting the golden cyanide hitherto unobtained), but on boiling the liquid it soon acquires a beautiful yellow tint; it is then only necessary to evaporate to dryness at a gentle heat, to obtain a very beautiful and very pure product, which does not require edulcoration.

I think this latter mode of preparation deserves the preference for the cyanide destined for medical use.—*Journ. de Pharm.* for November.

*On the Preparation of the Iodide of Barium.* By M. LABOURÉ.

The process which I propose is of very easy execution. I take sulphuret of barium, obtained by calcination of the sulphuret of barytes with charcoal. After each treatment with boiling distilled water, I allow it to subside for an instant in the flask, and then decant the clear liquid without its being necessary to filter, and immediately pour into it some solution of protiodide of iron, which is easily procured by placing iodine in contact with distilled water and a slight excess of iron filings.

The sulphuret of barium and the iodide of iron are mutually decomposed into soluble iodide of barium and into insoluble sulphuret of iron, which is always mixed with some oxide of iron which has been precipitated by the hydrate of barytes.

When near the point of saturation, a little of the liquid is filtered, and when it no longer precipitates either iodide of iron or the sulphuret of barium, which indicates that the decomposition is complete, and that no excess of the iodide of iron has been employed, it is filtered; the colourless liquid is received in a dish, and evaporated on the sand-bath until a pellicle is formed; the dish is then removed, and on cooling prisms of the iodide of barium form; the mother-water, which is colourless, is separated, and the crystals placed on a funnel to drain; as soon as this ceases, they are placed in a dry bottle with a ground stopper, which should be of a size proportionate to the quantity of iodide to be placed in it; otherwise the crystals become coloured after a certain time. When it is not desired to have the iodide in a crystalline state, the liquids are evaporated to dryness under constant stirring and at a gentle heat. In this operation the liquids should not be left exposed to the air for any length of time, otherwise they would become coloured.—*Journ. de Pharm.* for November.

*On the Preparation of the Hydriodate of Ammonia.*  
By M. LABOUR

In preparing the hydriodate of ammonia, the same method is followed as for the preparation of the iodide of potassium, substituting the carbonate of ammonia for that of potash; but it is necessary, in order to obtain a white salt, to keep the liquid slightly ammoniacal during evaporation.



Notwithstanding the addition of ammonia, it is not always possible to obtain a white salt; when coloured, it is only requisite to triturate it in a mortar, and to expose it to a current of dry air at a temperature of  $68^{\circ}$  to  $77^{\circ}$  Fahr.; after some hours, the iodine, to which it owed its colour, has been expelled, and the salt is perfectly white. If it be desired to have it in a crystalline state, it should be dissolved in solution of ammonia, which is saturated with it while in a boiling state in a flask, which is then corked; on cooling, the iodide crystallizes in perfectly white small cubes; it is dried quickly in a warm chamber, which should not have a temperature higher than  $77^{\circ}$  Fahr., and is then preserved in a well-stoppered bottle of such capacity as to be entirely filled by the iodide.—*Journ. de Pharm.* for November.

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## CHEMISTRY APPLIED TO ARTS AND MANUFACTURES.

*Some Observations on the Preparation of the Oxide of Uranium and of Titanic Acid, for Purposes of the Arts.* By M. O. KOHNKE.

As is well known, the oxide of uranium and also titanic acid are used in porcelain-painting; oxide of uranium also in oil-painting; it is however not so well known that both these preparations are likewise employed in the production of artificial teeth to produce the various tints in this enamel. I have prepared both substances in considerable quantities for these various purposes, and as they do not yet form ordinary articles of commerce, and promise to come into more extensive use, a few directions for the most advantageous method of obtaining them may not prove unacceptable. To prepare the oxide of uranium chemically pure, it was made according to the various directions of Duflos, Herschel, Ebelman and Peligot. Peligot's process deserves the preference, it being the most simple, and affording a beautiful chemically-pure product. A modification of Peligot's process was adopted to obtain the oxide of uranium for the purposes above mentioned, having ascertained by numerous experiments that a ferriferous oxide, prepared according to the following direction, does equally well. I will previously observe that the oxide of uranium was obtained from pechblende, titanic acid from the titaniferous iron from Egersund, and also from Rutil.

Finely pulverized pechblende is treated with dilute muriatic acid, with which it is left for some time in contact, being stirred at intervals, in order to extract the earths and the protoxide of manganese; it is then washed, dried, boiled with twice its weight of crude concentrated nitric acid, and evaporated to dryness.

After the residuous mass has been extracted with water, sulphuretted hydrogen is passed into the filtered solution, until the whole of the accompanying metals, copper, lead, arsenic, &c. are separated.



The filtered solution is again evaporated to dryness and redissolved, when a fresh quantity of peroxide of iron is left behind. This filtered solution of the nitrate of the oxide of uranium is now treated with caustic ammonia; the yellow precipitate of oxide of uranium and ammonia is collected,edulcorated, dried and heated, when a bright orange-coloured oxide of uranium is obtained. Although this oxide contains ammonia and iron, and also traces of zinc, manganese and cobalt, it presents no essential difference in its external appearance from the chemically-pure oxide. 100 parts pechblende afforded on an average 55 to 60 parts.

I formerly prepared oxide of uranium according to Herschel's directions, by dissolving the mineral in nitric acid, precipitating with ferrocyanide of potassium, dissolving the brown-red precipitate in weak solution of carbonate of potash, and precipitating this solution by means of caustic potash. The oxide of uranium and potash obtained in this manner is again dissolved in muriatic acid, and then thrown down with caustic ammonia; it affords a very pure product, but comparatively dear for the above purposes. In this manner however I obtained, on dissolving the precipitate produced by ferrocyanide of potassium, a residue, which consisted for the greater part of peroxide of iron. It was of a carmine-red colour, and formed, on being prepared with white lead and a drying oil, a brilliant flesh colour.

The titanitic acid was prepared from titaniferous iron; it also contained iron, but was perfectly well suited for the purposes above mentioned.

To obtain it, the mineral is finely pulverized, suspended in water and dried, mixed, according to the directions of H. Rose, intimately with half its weight of sulphur, and fused. The cold mass is then reduced to a very fine powder, upon which concentrated muriatic acid is poured over it, and when the iron is extracted it is washed, dried and heated to faint redness. The iron does not always combine equally well with the sulphur, from its requiring a certain degree of heat, as is the case in the preparation of the sulphuret of iron. I found it therefore advantageous to convey the well-mixed powder in portions into a red-hot crucible, and to wait each time until the combination had been indicated by the characteristic phenomenon of ignition. When the whole has been conveyed into the crucible, this is covered, and kept for a short time at a red heat, and the cold mass then treated as above described.

The titanitic acid thus prepared contains traces of iron, manganese and tin, and forms a yellowish-white powder. 100 parts of titaniferous iron afford generally about 85 to 90 parts of titanitic acid.

From Rutil the titanitic acid is prepared by mixing the finely-pulverized mineral intimately with 4 parts of a mixture in equal proportions of dry carbonate of soda and carbonate of potash, fusing, and removing the excess of alkali from the cold mass by means of water; the residue, which consists for the greater part of titanate of potash and soda, is dissolved in concentrated muriatic acid, diluted with water, filtered, and precipitated with caustic ammonia; the



precipitate, dried and ignited, likewise affords a yellowish-white titanic acid, and in about the same quantity.—*Archiv der Pharm.* for October.

*Electro-Lace.* By Mr. JOHN A. PHILLIPS.

Electro-lace is made by stretching common net on a frame of stout copper wire, and then brushing it over with plumbago until its surface has acquired a uniformly black colour. It is then connected with the negative pole of a galvanic battery, and subjected to the voltaic action between two plates of copper positively electrified, which causes it to be rapidly and effectually coated with metal, each thread being inclosed in a tube of copper.

When it is desired that the sheets of lace be of large size (several feet square for instance), it will be necessary to divide the large frame by fine wires into squares of seven or eight inches, which forming nuclei for the deposit of metal, enables the sheets to be made of any extent, and at the same time tends to strengthen the work.

The uses of electro-lace are similar to those of common wire gauze, but when silvered or gilt it forms a beautiful material for fancy work.

The author has also constructed a voltaic battery of electro-lace, which from the numerous points its surface presents is presumed to be superior to the wire gauze employed in the common gauze battery.

Mr. Phillips has also brought forward a plate for the negative element of a voltaic battery, which being made of linen coated with copper, and afterwards silvered and platinized, afforded from its greater roughness a superior surface to that of the plates in common use. This process was also stated to be applicable to the coating of ropes with copper, as lightning conductors for ships, considerable superficies with little weight of metal being thereby obtained.—*Tenth Annual Report of the Royal Cornwall Polytechnic Society.*

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## PROCEEDINGS OF SOCIETIES.

### *Chemical Society of London.*

THIS Society held its first meeting this session on Tuesday, November 7th (Arthur Aikin, Esq., President, in the Chair), when the following communications were read:—

“On the Products of the Distillation of Meconic Acid,” by Dr. John Stenhouse.

When meconic or komeconic acids are subjected to distillation at a temperature varying from  $510^{\circ}$  to  $550^{\circ}$ , they yield pyromeconic acid, which passes into the receiver partly as an oily liquid and



partly as a crystalline sublimate. Towards the close of the distillation a few crystals of another acid sublime into the neck of the retort.

Pyromeconic acid, purified by redistillation and crystallization from alcohol, is found by analysis to contain  $C^{10}H^4O^6$ . A solution of the acid feebly reddens litmus paper. It refuses to combine with potash and ammonia, crystallizing unaltered from the alcoholic alkaline solution.

Pyromeconate of copper is formed by heating hydrated oxide of copper with pyromeconic acid; it forms bright green, slender acicular crystals, but little soluble in cold water or alcohol. They are anhydrous, and contain  $CuO, C^{10}H^3O^5$ .

Pyromeconate of iron is procured by adding persulphate of iron to a tolerably dilute boiling solution of pyromeconic acid. The salt separates on cooling in small but distinct garnet-red crystals of rhomboidal figure, and having but little solubility. They contain  $Fe^2O^3, 3C^{10}H^3O^5$ .

Pyromeconate of silver is grayish-white, insoluble, and readily reduced by boiling; the metal coats the interior of the vessel with a mirror-like covering.

The author then proceeds to point out distinguishing differences of character between the two isomeric bodies, pyromeconic and pyromucic acids.

The second acid above mentioned, produced in small quantity when meconic or komenic acid is subjected to distillation, is next described. It is obtained most abundantly by subliming meconic acid in Dr. Mohr's apparatus at a very high temperature, and purified from adhering pyromeconic acid by washing with cold water or alcohol. Dr. Stenhouse calls this substance parakomenic acid. It is deposited from a hot aqueous solution in small, hard, crystalline grains, nearly colourless; it resembles in its character and reactions komenic acid, but differs in some points from that substance. It is identical in composition however with komenic acid, inasmuch as it is found by analysis with chromate of lead to contain  $C^{12}H^4O^{10}$ .

*Komenate of Peroxide of Iron.*—When persulphate of iron is added to a cold and concentrated solution of komenic acid, and left to stand, small, hard, black crystals of the above salt are slowly deposited upon the sides and bottom of the vessel. They are but feebly soluble either in cold or hot water, and yield on analysis  $Fe^2O^3, C^{24}H^{11}O^{13}$ . If persulphate of iron is mixed with a hot instead of a cold solution of komenic acid, and the whole maintained some hours at  $150^\circ$ , the metal is reduced to the state of protoxide, and the original deep red colour of the solution disappears.

“Further Contributions to the Chemical History of the Products of the Decomposition of Uric Acid,” by William Gregory, M.D., F.R.S.E.

After alluding to his previous researches on this subject, the author proceeds to describe his further investigations on uric acid, and the compounds resulting from its oxidation. Economical processes are given, by which alloxantine, dialurate of ammonia, and consequently



dialuric acid, may be procured, the first from the mother-liquid of alloxane, the latter from the same source, or from the residual liquors of alloxantine. The analysis of dialuric acid agrees with the hypothetical formula given by Liebig and Wöhler. The preparation of the acid thionurate of ammonia from the thionurate is next described, and this is followed by a new acid, termed by the author the alloxino-sulphurous, composed, as indicated by the analysis of the potash salt, of 2 atoms sulphurous acid, and 1 atom of alloxane. It is prepared by adding in slight excess a saturated solution of sulphurous acid gas in water to a saturated solution of alloxane in cold water; and to these mixed liquids solution of caustic potash is to be added with care, until the slightest possible alkaline reaction is obtained; the salt readily separates. Alloxanic acid is prepared by allowing a solution of pure alloxantine in distilled water to remain until it loses the property of giving a violet precipitate with barytic water, and finally yields a white precipitate. By gentle evaporation this acid is obtained in crystals. It has the same composition in 100 parts as anhydrous alloxane. Dr. Gregory concludes by stating, that he considers it difficult to account for the production of this acid in the above process, as no other compound seems to be formed, and the change takes place in lightly-corked and filled vessels as readily as when exposed to the air. Besides, the oxidation of alloxantine yields alloxane. It is possible that it may not be alloxanic acid, although agreeing with it in its reactions, and may probably be isomeric with alloxantine, as alloxanic acid is with alloxane. Dr. Gregory is still engaged in these researches, and hopes, at no very distant period, to follow the present communication with another on the same subject.

“Additional Observations on *Æthogen*,” by W. H. Balmain.

Mr. Balmain states that he had in his former papers described numerous *æthonides* of metals, which he has since found to be simply another compound of boron and nitrogen, and which differs from his previously-described *æthogen*, prepared by heating mellon with boracic acid, in phosphorescing before the blowpipe. It is formed whenever a compound of *æthogen* with a metal is decomposed by the abstraction of the metal by means of acids. The simplest method of preparing this phosphorescent compound is by heating together 12 parts of cyanide of mercury,  $1\frac{1}{2}$  of boracic acid, and 1 of sulphur, proportions which differ from those previously given in containing a larger quantity of the cyanide of mercury. The author considers that the compound of phosphorus and nitrogen, discovered by H. Rose, has probably similar relations to *æthogen*, and proposes to form this body by adding portions of phosphorus to the chloro-amidide of mercury placed in a flask, a gentle heat being maintained, and the materials agitated at intervals; when the phosphorus ceases to produce decomposition, the heat is to be raised nearly to redness.



# THE CHEMICAL GAZETTE.

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## SCIENTIFIC AND MEDICINAL CHEMISTRY.

*On the Products of Decomposition of Glycerine by destructive Distillation.* By Prof. REDTENBACHER.

[Continued from page 723.]

THE name of *acrylic acid* has been assigned by the author to the product of oxidation of acroleine, which we have already had occasion to mention. It is best obtained by the action of acroleine on oxide of silver, for which purpose the oily portions which passed over between  $104^{\circ}$  and  $140^{\circ}$  in the rectification of the oily products of the distillation of the fat may be employed, after having been rectified over chloride of calcium. The oxide of silver is conveyed into a flask or tubulated retort, with a Liebig's refrigerator placed perpendicularly, and the acroleine poured into the flask by means of a Welter's funnel. The mass becomes considerably heated, but the vapours always flow back from the refrigerator. The oxide of silver becomes black, and the sides of the vessel are covered with a black metallic mirror. It is allowed to stand until the odour of acroleine has disappeared; some water is then poured on to the mass, and the intermixed bright oil, which resembles in smell eupione, is distilled off in the water-bath; the mixing with water and distilling is repeated until no more oily substance passes over; more water is then added to it, and it is heated to boiling. The acrylate of silver dissolves; it is filtered while boiling hot, and the product placed in the dark. The acrylate of silver separates in quadrilateral prisms, heaped together cauliflower-like; they are frequently covered with a dust of reduced silver, which can however be readily washed away. The mother-ley is employed to extract the contents of the flask. The last portion cannot be concentrated without decomposition, but on freezing it affords laminæ which have a nacreous lustre. The acrylate of silver thus obtained is not entirely free from the oils produced by the distillation of the fat, and cannot be recrystallized without decomposition. It is therefore necessary to decompose the pure salt with sulphuretted hydrogen, to combine the acid with soda, to distil the soda salt with sulphuric acid, and to saturate the



hydrated acrylic acid thus obtained boiling hot with oxide of silver; on cooling, the pure salt crystallizes from the solution.

The *Acrylate of Silver* forms white, silky, elastic needles; it is sometimes obtained as a fine crystalline powder. The precipitate produced by nitrate of silver in acrylate of ammonia is curdy, crystalline, and somewhat difficult to separate from the ammonia salt; it is anhydrous, has a metallic taste, dissolves with difficulty in cold water, becomes slowly black by exposure to the light, more quickly in a warm and moist atmosphere; heated above  $212^{\circ}$  it detonates slightly, gives off yellow acid vapours, and leaves behind a large jagged tissue of carburet of silver, from which the whole of the carbon is removed by long ignition. The amount of silver is best determined by ignition, since the salt is not entirely decomposed by hydrochloric acid and the metallic chlorides. The analysis gave the following results:—

	Cauliflower- like crystals.	Laminar crystals.			Crystal- line powder.	Silky needles.	Atoms.	Calcu- lated.
	I.	II.	III.	IV.	V.	VI.		
C....	20.35	21.06	20.49	20.59	20.31	20.32	6=	455.1
H ..	1.95	1.94	2.12	1.85	2.00	1.86	3=	37.4
O....	15.59	13.34	13.94	14.34	13.54	13.19	3=	300.0
AgO	62.11	63.22	63.45	63.22	64.15	64.63	1=	1451.6
		Atomic weight of the acid.						2244.1
	885	840	866	844	794			793

*Acrylate of Soda* forms small transparent prisms, which effloresce by exposure to the air; the salt has a bitter saline taste, puffs up on being heated, is easily soluble, and when dried at  $212^{\circ}$  gives 32.96 per cent. soda, and dried by exposure to the air 32.5 per cent. water. It agrees very well with the formula  $C^6 H^3 O^3$ ,  $NaO + 3 aq$ .

*Acrylate of Barytes* is a gummy brittle mass, which dissolves readily in water, but with difficulty in alcohol, and contains 54.3 per cent. barytes. The formula  $C^6 H^3 O^3$ ,  $BaO$  requires 54.72.

*Acrylate of the Oxide of Æthyle*.—On distilling concentrated acrylic acid with sulphuric acid and alcohol, washing the product with water and solution of carbonate of soda, drying over chloride of calcium and again rectifying, a substance was obtained which was very similar in odour to formic æther, and which contained 49.3–49.7 per cent. carbon and variable quantities of hydrogen. Formic æther contains 49 per cent. carbon. On distilling pure acrylate of soda or acrylate of barytes with sulphuric acid and alcohol, the rectified product was transparent, of very agreeable aromatic odour, and was not very thick: it boiled at  $144^{\circ}$  Fahr. On placing it with chloride of calcium to remove the water, it became perceptibly changed after 12 hours and more fluid; the chloride of calcium, which at first had become crystalline, became again white, opake and pulverulent; the liquid now rectified contained 55.34 carbon and 9.38 hydrogen. Acrylate of æthyle would require 60.28 carbon and 7.93 hydrogen, while acetic æther contains 54.83 carbon and 9.02 hydrogen. There is no doubt that the originally formed acry-



late of æthyle has become converted, under the influence of a somewhat alkaline chloride of calcium, into acetic æther.

*Hydrate of Acrylic Acid.*—When acrylate of silver is treated in a glass bulb with sulphuretted hydrogen gas, the bulb should be kept cool in order to moderate the violent reaction. The hydrated acid is subsequently distilled over, and is then rectified, but even then the last portions which pass over always contain a slight excess of water. They contain 47·57 carbon and 6·04 hydrogen, while the formula  $C^6 H^3 O^3 + HO$  requires 50·29 carbon and 5·51 hydrogen. The hydrate of acrylic acid is a limpid liquid resembling acetic acid; it has at the same time an empyreumatous smell, which however is not disagreeable; it does not solidify at  $32^\circ$ , has a pure acid taste, may be mixed with water in every proportion, boils at above  $212^\circ$ , and distils over unaltered. Dilute sulphuric and muriatic acids do not act upon it; with nitric acid it affords acetic acid, formic acid, &c. Towards bases it behaves like acetic acid and formic acid, and on being treated with alkalies for some time is converted into acetic acid. Its salts are mostly easily soluble, the silver salt the least so. The sole characteristic distinction of acrylic acid from acetic and formic acids, besides taste and smell, is the behaviour of its silver salt, which is rendered black at  $212^\circ$ , is reduced by boiling water, and puffs up on being heated, in dendritic form, with slight detonation, while formate of silver is reduced at the ordinary temperature, and acetate of silver, on the contrary, stands a boiling heat, and burns quietly in a porcelain crucible, leaving behind spiculæ of silver.

*Acrylous Acid.*—There appears to exist between acroleine and acrylic acid an acrylous acid, precisely as is the case with the acetylous acid, which stands between aldehyde and acetic acid; it is probably contained in the caseous precipitate produced when acroleine is mixed with a solution of nitrate of silver, and which is rapidly reduced at the ordinary temperature. It would consist of  $C^6 H^3 O^2 + aq$ .

*Formic Acid and Acetic Acid.*—Dumas found that these acids were formed on fusing glycerine with hydrate of potash; this is perfectly correct, but Dumas's explanation is now no longer valid. When glycerine is heated with hydrate of potash, the mass becomes more fluid, and when exposed with caution to a higher temperature until a dry white mass of salt is obtained, and this is then distilled with dilute sulphuric acid, formic acid, acetic acid and some acroleine are obtained. It is probable that acroleine is first formed, then acrylic acid, and from this formic acid and acetic acid. 1 atom acrylic acid +  $HO + O^2 =$  1 atom acetic acid + 1 atom formic acid and 2 atoms acrylic acid +  $3HO$  afford 3 atoms acetic acid. This explains the presence of acetic acid in the product of distillation of fats containing glycerine. The new acid, formed, according to Döbereiner\*, by the oxidation of glycerine by means of platinum black, is probably acrylic acid, acetic acid, or formic acid.



*Indifferent Products of the Decomposition of Acroleine.*—The author applies the name of *Disacryle* to the white body which is constantly formed when acroleine is left for any length of time in contact with water; the aqueous liquid at the same time acquires an acid reaction. The disacryle prepared from pure acroleine is a white powder, which is not crystalline, is void of taste and smell, and is wholly insoluble in acids and alkalies and in other solvents. It is slowly dissolved by hydrate of potash in a state of fusion; acids precipitate white flakes from the aqueous solution of the fused mass. Disacryle dried at  $212^{\circ}$  consists of—

	I.	II.	Atoms.	Calculated.
Carbon . . . . .	61.15	61.17	10 = 758.5	60.87
Hydrogen . . . . .	7.46	7.40	7 = 87.4	7.01
Oxygen . . . . .	31.39	31.43	4 = 400.0	32.12
			<hr/> 1245.9	

It may therefore originate from acroleine by the separation of C H, but the carburetted hydrogen C H may easily be converted into acrylic acid, acetic acid and formic acid. When the acid water which has been separated from the disacryle is saturated with carbonate of soda, three different kinds of soda salts are obtained, which are not easily separable from each other. When the various kinds of crystals are separated mechanically, they will readily be found, upon close examination, to consist of formate, acetate and acrylate of soda. It is owing to the reaction here treated of that a drop of acroleine brought on to litmus-paper is converted into a white substance, leaving behind a red spot. When pure and perfectly dry acroleine is inclosed air-tight in a glass bulb, it is likewise changed into disacryle. The mass which forms is not acid (owing to the absence of air), but it soon becomes so on exposure to the atmosphere and to moisture.

*Disacrylic Resin* is a body which is sometimes formed under precisely the same circumstances as disacryle. It is white, pulverulent, melts at  $212^{\circ}$ , is not soluble in water, but dissolves readily in alcohol, æther and alkalies. It separates from the alcoholic solution on evaporation in brittle, glittering scales. The alcoholic solution is rendered milky by the addition of water; it has a decidedly acid reaction, and affords precipitates with metallic salts. Disacrylic resin is very difficult to dry perfectly; it then contains 1 atom of water and 1 atom of oxygen less than disacryle:—

		Atoms.	Calculated.
Carbon . . . . .	66.58	20 = 1517.1	66.56
Hydrogen . . . . .	7.39	13 = 162.2	7.12
Oxygen . . . . .	26.03	6 = 600.0	26.32
		<hr/> 2279.3	

*Acrylic Resin.*—On treating acroleine with alkalies in solution, a resinous product is formed under evolution of an odour resembling cinnamon. The author was only able to study this reaction with impure acroleine, which he poured upon hydrate of lime. It became immediately brown, and a brown resinous mass formed around the



lime; the liquid was poured off, and the resin was treated with alcohol containing æther, the alcohol and æther were distilled off, and the residue decomposed by dilute muriatic acid, which afforded a pale yellow precipitate (A), which had an odour of cinnamon; it was filtered, washed with water and dried. The residue insoluble in æther and alcohol was boiled along with the lime in water, which afforded a solution (B); a portion of this (Ba) was decomposed with hydrochloric acid; the yellow precipitate again combined with lime, and then again separated by hydrochloric acid; another portion (Bb) was decomposed with hydrochloric acid, and the yellow flocculent precipitateedulcorated. The portion (C) insoluble in water wasedulcorated with hydrochloric acid and water. All these bodies dry with difficulty, and become strongly negative electrical by friction. Their composition approaches that of disacryle:—

	A.	Ba.	Bb.		C.
Carbon.....	59·03	58·94	58·88	59·41	60·04
Hydrogen .....	6·69	6·74	7·03	6·98	7·47
Oxygen .....	34·28	34·26	34·09	33·61	32·44

The author observes, in conclusion, that it was owing to the difficulty of procuring large quantities of *pure* acroleine, and the injurious action on the eyes, that the examination could not be rendered more complete. Probably we may some day succeed in preparing larger quantities of pure acroleine from other substances. Mannite, which is so nearly allied to glycerine, affords on distillation a product which has the odour of acroleine; moreover, when large masses of sugar are burnt, there is given off a very penetrating odour, which affects the eyes.—Liebig's *Annalen* for August.

*Observations on Legumine.* By MM. DUMAS and CAHOURS.

The analysis of legumine recently published by M. Rochleder\*, and the properties assigned to this product, do not establish its identity with the caseine of milk in a satisfactory manner. According to that chemist, legumine, precipitated by means of weak acetic acid from water in which peas or beans reduced to a pulp had been digested, is partly soluble in potash, and may be separated by this reagent into two products, one of which is soluble in the alkali and is identical with caseine. However, the caseine obtained from milk has been found by all experimenters to contain on an average 15·8 per cent. of nitrogen, while the product described by M. Rochleder afforded him 14 per cent., *i. e.* one-fifteenth less, which would suppose the product to be so impure that no conclusion can be drawn from it. M. Rochleder, who draws a comparison between the carbon and hydrogen of these substances, has unfortunately neglected to do the same with respect to the nitrogen; moreover, a sample of legumine of bean containing only 53 per cent. carbon, affords in

\* See this Journal, p. 540.



the legumine converted into caseine 54·5 carbon, the nitrogen always remaining the same, a fact somewhat difficult to explain.

M. Rochleder has not solved the question relative to legumine. We have at present no doubt that the nitrogenous substance of the *Leguminosæ* contains two distinct substances, of different composition, which occur in variable proportions in the several leguminous plants, or even in the different specimens of one and the same species.

We obtained from hemp-seed, by the same means, a substance which contains the same amount of carbon as the legumine of almonds, but not more than 14·8 to 15 per cent. nitrogen. If, in fact, there exist two distinct substances, containing the same proportions of carbon and of hydrogen with different quantities of nitrogen, this latter element alone would be susceptible of variation in the several samples analysed. However it may be, we do not think it advantageous to confound at present with caseine a product which is thrown down in the cold by very dilute acetic acid, and of which nine-tenths at least are soluble in concentrated and cold acetic acid, and which is entirely coagulated by heat.—*Journ. de Pharm.* for November.

#### *Action of Sulphurous Acid on Metallic Oxides.*

The following are the results of experiments on the action of sulphurous acid on metallic oxides by M. Vogel.

1st. Red oxide of mercury at first becomes protoxide combined with sulphurous and sulphuric acids, and is afterwards completely reduced to the metallic state by sulphurous acid.

2nd. Pernitrate of mercury is slowly reduced by sulphurous acid, but the reduction becomes perfect with the aid of heat; the protonitrate is reduced in the same manner, but more rapidly.

3rd. Bichloride of mercury is not reduced, under the same circumstances, by sulphurous acid, lower than to protochloride; and when the solution of the bichloride is mixed with a sufficient quantity of sulphurous acid, it is not decomposed by the caustic alkalies added in excess; the mercury remains in solution in the alkaline liquor.

4th. Protochloride of mercury is not reduced to the metallic state by sulphurous acid, but merely to a subchloride of mercury; but subpersulphate of mercury (turbith mineral) is entirely reduced by sulphurous acid.

5th. Neither oxide nor nitrate of silver is completely reduced by sulphurous acid.

6th. The oxides of zinc, antimony and uranium, do not suffer the slightest reduction by sulphurous acid.

7th. The black oxide of copper calcined and left in contact with sulphurous acid, becomes brown protoxide, and the acetate of the oxide becomes acetate of suboxide when heated; the greater part of the copper being deposited in the state of brown suboxide.

8th. Sesquioxide of iron when calcined does not yield any of its



oxygen to sulphurous acid; but the peracetate of iron becomes protoacetate by its action.

9th. Molybdic acid is not reduced by sulphurous acid, but molybdate of potash is reduced to a low state of oxidizement, to the blue compound or molybdous acid.—*Journal de Pharmacie et de Chimie*, Sept. 1843., and *Philosophical Magazine* for November.

*On the Composition and Origin of the Petroleum found in the Down Holland Moss near Ormskirk.* By E. W. BINNEY and J. HAWKSHED TALBOT.

Although it is by no means uncommon to find traces of an oily matter floating upon the surface of the water that drains out of the peat bogs in the low mosses of Lincolnshire and other parts of England, the authors believe that the occurrence of peat so strongly impregnated with petroleum as that found in Down Holland has not yet been noticed. Baron Thénard\* describes this substance as follows:—"Petroleum less fluid than naphtha, of which it seems to be a modification, brownish-black, almost opaque, of a strong tenacious odour, unctuous to the touch; specific gravity 0·854, burns, leaving but little residue, and gives, on distillation, an oil similar to the naphtha. Found it at Gabian, near Berziers, in Auvergne, near Clermont, in Switzerland near Neufchatel, in England at Ormskirk in Lancashire, and Amiano in Italy, in Sicily, in Transylvania, in India, &c. It often floats on water; the sea is sometimes covered with it near the Volcanic Isles of Cape de Verde." Mr. J. E. Bowman has analysed a specimen of the pitchy peat possessing an empyreumatic smell, found under an old sward field in Formby about six inches beneath the surface. Its organic constituents in 100 parts were 60·31 C, 8·86 H, and 30·83 O. This, when compared with the analysis of common peat made by Regnault, 60·89 C, 6·21 H, 32·90 O, shows that the former differs from the latter in having lost 58 C and 2·7 O, and gained 2·65 H. Mr. Bowman found 73 C united to 69 H in a specimen of the dark-coloured empyreumatic oil (petroleum) skimmed from the surface of a pool of stagnant water which drained from the upper bed of peat where that deposit is covered by a bed of about fifteen inches of drift sand.

On taking Professor Johnson's formula	}	160 C	128 H	128 O
of the composition of lignine . . . . .				
And deducting the equivalents of the	}	145	128	55
pitchy peat before analysed. . . . .				

There is a loss of . . . . . 15 C      0 H      73 O

This shows the removal of 15 atoms of carbonic acid gas and 73 atoms of oxygen, supposing the pitchy peat to have been produced from woody fibre. But this specimen being a mechanical admixture of peat and petroleum, little value can be attributed to it. The better way to show the true results of the decomposition is to compare the analysis of the petroleum with that of woody fibre.

Woody fibre . . . . .	160 C	128 H	128 O
Petroleum . . . . .	73	69	0
Loss . . . . .	87 C	58 H	128 O

\* *Traité de Chemie*, tom. iii. p. 445.



The pitchy deposit found under the arable fields possesses little or no smell, the volatile oil affording it having doubtless been evaporated. Its specific gravity is greater than that of the petroleum, from the circumstances of its having lost some of the lightest constituents of that oil, and also combined with a considerable amount of oxygen. On first inspecting the peat, the authors imagined that the petroleum had its origin from some spring which flowed up through the moss from a fissure in the strata underneath; but after examining these deposits, composed of silty clay, sand, till, and most probably portions of the new red sandstone formation, and finding the *lower* bed of peat not only destitute of petroleum, but *quite dry*, they became convinced that the oil could not have come from below. They next considered that it might possibly proceed from a spring which rose out of the higher land at Halsall or Down Holland, and then flowed down into the moss; but the peat on the eastern side, although moist and nearest to the source of any spring from that part (if such were the case), was totally destitute of petroleum. The only remarkable feature connected with the upper bed of peat, is the western portion of it being covered up with a bed of sand, and being probably sometimes subject to an infiltration of sea-water according to Mr. Harkness's information. These circumstances, added to the fact of the petroleum being found most plentifully at the edge of the sand, lead the authors to the conclusion that it is produced by the decomposition of the upper bed of peat under the sand.

The chemical process by which such singular effects have been produced is a subject more fitted for the consideration of the chemist than the geologist; but the authors suppose that the petroleum is the result of slow combustion in the peat, and has been produced by a process partly analogous to that which takes place in the destructive distillation of wood in close vessels, where, owing to a total absence of oxygen, the combination of hydrogen and carbon, in the form of hydro-carbons, is effected.—*Proceedings of the Manchester Geological Society* for 1843.

#### *How to distinguish between real and spurious Gilding.*

In many cases in which it is difficult to employ the usual test for gold, especially for distinguishing between real and spurious gold leaf, gilt paper, &c., M. Altmüller recommends the application of mercury, which rubbed in on true gilding immediately produces a white spot, while it has no action on spurious gold (consisting of alloys of copper). On the other hand, an acid solution of mercury in nitric acid leaves untouched real gold, and produces a white spot on the spurious. The thinnest layers of gold, which it is frequently impossible to detect by means of *aqua regia*, are immediately recognised by this test. The coating of varnish must be removed previous to its application.—*Allgem. Wien. Polytech. Journ.*, 1843, p. 225.



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